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ARMY PRELIMINARY EVALUATION PROTOTYPE OH-58A HELICOPTER WITH XM27E1 WEAPON SUBSYSTEM

FINAL REPORT

JOHN NAGATA
PROJECT ENGINEER

JOSEPH WATTS
PROJECT OFFICER/PILOT

EDWARD BAILES
FLIGHT TEST ENGINEER

JANUARY 1970

DISTRIBUTION

US ARMY AVIATION SYSTEMS TEST ACTIVITY
EDWARDS AIR FORCE BASE, CALIFORNIA 93523

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ABSTRACT

The Army Preliminary Evaluation of the OH-58A prototype helicopter was conducted in the vicinity of Arlington, Texas, during the period 26 June to 9 July 1969. Thirteen test flights were conducted for a total of 14.5 hours of which 9.1 hours were productive. The evaluation consisted of limited quantitative and qualitative stability and control tests in the armed scout configuration only. The handling qualities of the OH-58A are satisfactory for the accomplishment of the armed scout mission.

FOREWORD

During the conduct of the OH-58A prototype helicopter Army Preliminary Evaluation, the test helicopter with special instrumentation installed was maintained by Bell Helicopter Company personnel. Data reduction support and office facilities were also provided under contract through the Bell Helicopter Company.

TABLE OF CONTENTS

INTRODUCTION

BACKGROUND

1. In 1967, the US Army Aviation Systems Test Activity (USAASTA) conducted an Army Preliminary Evaluation (APE) of a production Bell "Jet Ranger" helicopter, model 206A. A contract was awarded to the Bell Helicopter Company in 1968 to produce for the US Army a light observation helicopter (LOH) designated the OH-58A. Authority for USAASTA to conduct a preliminary evaluation of a prototype OH-58A was issued by the US Army Aviation Systems Command (USAAVSCOM) in a test directive dated 29 April 1969 (ref 1, app I). Stability and control tests were conducted in the vicinity of Arlington, and armament firing tests were conducted near Fort Hood, Texas.

TEST OBJECTIVES

2. The test objective was to conduct a limited handling qualities investigation of the OH-58A in the armed scout configuration in order to:

a. Provide quantitative and qualitative engineering flight test data to serve as a basis for an estimate of aircraft suitability for its intended mission.

b. Detect and allow early correction of deficiencies, as well as provide a basis for evaluation of changes incorporated to correct these deficiencies.

c. Assist in determining the flight envelope to be used by US Army pilots for future weapons subsystem development tests, service tests and operational usage.

DESCRIPTION

3. The OH-58A LOH is manufactured by the Bell Helicopter Company, Fort Worth, Texas. The single main rotor is a two-bladed, semirigid, teetering type, and the antitorque tail rotor is a two-bladed, semirigid, delta-hinge type. The cockpit provides side-by-side seating for a crew of two (pilot and copilot/observer), and the cargo compartment has provisions for two passengers. Dual flight controls are provided. Cyclic and collective controls are of the hydraulically boosted, irreversible type, and the antitorque

control is unboosted. The main landing gear is a fixed, energy-absorbing skid type. The helicopter is powered by an Allison T63-A-700 free turbine, turboshaft engine with a takeoff power rating of 317 shaft horsepower (shp) at sea level (SL), standard day conditions. The main transmission has a rating of 270 shp (maximum continuous) with a takeoff power limit of 317 shp (5-minute rating).

4. The XM27E1 armament subsystem consists of one XM134 high-rate 7.62mm gun (GAU-2B/A) with mount, feed system, ammunition boxes and an XM70E1 sight for pilot operation. The weapon subsystem is mounted on the left side of the helicopter near the longitudinal center of gravity (cg). The XM134 gun is adjustable in elevation from 5 degrees above to 20 degrees below waterline zero and is operated by either the pilot or copilot/observer.

SCOPE OF TEST

5. The OH-58A was evaluated with respect to its mission as an armed scout helicopter as defined in the detail specification (ref 2, app I) and MIL-H-8501A (ref 3). Thirteen test flights were conducted for a total of 9.1 productive hours. The test was limited to evaluation of the handling qualities in the armed scout configuration. The flight restrictions and operating limitations utilized during this evaluation were provided by the manufacturer and the type inspection authorization (TIA) issued by the Federal Aviation Administration (FAA).

METHODS OF TEST

6. Accepted standard flight test methods were used to acquire data for analysis and evaluation of military and detail specification compliance. During the armament firing tests, the controls were held fixed, and the resultant aircraft motions were recorded.

7. A detailed list of the test instrumentation utilized is contained in appendix III. Photographs of the cockpit and cabin instrumentation are presented in appendix IV.

CHRONOLOGY

8. The chronology of testing is as follows:

Test directive received	5 May	1969
Test aircraft received	26 June	1969
Test started	27 June	1969
Test completed	8 July	1969
APE debriefing	14 July	1969
Draft report submitted	September	1969

RESULTS AND DISCUSSION

GENERAL

9. Within the scope of this limited evaluation, the overall stability and control characteristics of the OH-58A were satisfactory for the accomplishment of the armed scout mission.

10. Although it was not within the scope of the test directive, a cursory qualitative evaluation was conducted on the production OH-58A. The most objectionable characteristics discovered were: Cabin ventilation was inadequate, and the twist grip throttle friction was excessive with no manual adjustment incorporated.

STATIC LONGITUDINAL CHARACTERISTICS

Control Trim Characteristics

11. Level-flight trim curves were obtained to determine the control positions and control margin in stabilized level flight throughout the allowable airspeed envelope. The results of these tests were satisfactory and are presented in figures 1 and 2, appendix II. The control position gradients were determined to be positive throughout the airspeed envelope tested.

Static Longitudinal Stability

12. The collective-fixed static longitudinal stability of the OH-58A was evaluated by examining the longitudinal cyclic control position variation with airspeed at trimmed zero-sideslip flight conditions. Various trim airspeeds throughout the allowable flight envelope were used. The results of this test are presented in figures 3 and 4, appendix II, and are satisfactory. The longitudinal static stability was positive throughout the airspeed envelope tested. This complied with paragraph 3.3.1.0, MIL-H-8501A (PRS 3).

STATIC LATERAL-DIRECTIONAL STABILITY

13. The static lateral-directional stability and effective dihedral characteristics of the OH-58A were determined to be satisfactory. Bank angle and lateral-directional control positions as a function of sideslip angle were evaluated during steady-heading

sideslips. As may be seen in figures 5 through 7, appendix II, the effective dihedral was weakly positive at the low trim airspeed and became more strongly positive as airspeed was increased. In compliance with paragraph 3.3.9, MIL-H-8501A, control harmony was satisfactory for all conditions tested (PRS 3).

SIDEWARD AND REARWARD FLIGHT

14. The handling qualities of the OH-58A in sideward and rearward flight were evaluated and found to be accpetable within the scope of the test conditions (2990 pounds, 1950-foot density altitude (H_D)). The control margin complied with paragraph 3.3.4 of MIL-H-8501A and was adequate in sideward flight in both directions. The maximum allowable speed (30 knots true airspeed (KTAS)) does not comply with paragraph 3.3.2, MIL-H-8501A. The aircraft characteristics in rearward flight were satisfactory with sufficient control margin remaining up to the maximum allowable speed of 30 KTAS. Test results are presented in figures 8 and 9, appendix II (PRS 5).

ARMAMENT FIRING

15. The handling qualities of the OH-58A were evaluated while firing the XM27E1 weapon subsystem and were found to be satisfactory in every mode of flight tested. The most severe aircraft reaction was experienced while firing from a hover (in ground effect (IGE) and out of ground effect (OGE)). This reaction consisted of a strong nose-down longitudinal pitching motion accompanied by a slight right roll with coupled left yaw. Minimum pilot effort was required to correct for this reaction and maintain a constant aircraft attitude. The magnitude of the required control manipulations was not considered excessive or objectionable. Firing the weapon system during transition from a hover to forward flight created no significant problem. After the necessary control inputs were applied to counteract the nose-down, right roll, left yaw tendency, the only noticeable effect was a slight decrease in the forward acceleration due to the recoil effect of the XM134 minigun. No adverse effects were noted when the weapon system was fired during transition from level flight to a hover. The aircraft displayed satisfactory characteristics in level flight. At low airspeeds (below 50 knots indicated airspeed (KIAS), the most adverse reaction was encountered while firing the XM134 minigun weapon system in the fully depressed position (20 degrees below waterline zero). A pronounced right roll, accompanied by a slight left yaw, occurred while the minigun was being fired. However, this condition was effectively damped without undue pilot effort when the firing ceased.

At the higher airspeeds (up to never exceed airspeed (V_{NE})), the OH-58A displayed more stable characteristics with only slight reactions to firing the weapon system. Typical time histories of hover, level flight and high-powered descent, while firing with various degrees of sideslip, are presented in figures 10 through 14, appendix II.

DYNAMIC STABILITY

16. The dynamic stability characteristics of the OH-58A were evaluated by disturbing the helicopter by 1-inch control pulse inputs about all three axes. Examples may be seen in figures 15 and 16, appendix II. Dynamic stability characteristics about all three axes were found to be satisfactory and complied with paragraphs 3.2.11 and 3.2.11.2, MIL-H-8501A. No control coupling and only a slight aerodynamic lateral-directional coupling occurred at all trim speeds tested (PRS 3).

CONTROLLABILITY

17. The controllability of the OH-58A was investigated by disburbing the helicopter from stabilized hover and trimmed level flight conditions by step control inputs. Test results shown in figures 17 through 28, appendix II, were analyzed by examining the maximum rates and accelerations along with the time required to achieve these maximums and were determined to be satisfactory under all conditions tested. The maximum displacements achieved were well in excess of the minimum requirements of paragraphs 3.2.11.1, 3.2.13, 3.3.5 and 3.3.18, MIL-H-8501A. The maximum rates did not comply with paragraph 3.3.15 of MIL-H-8501A but were not objectionable (PRS 4).

AUTOROTATIONAL ENTRY

18. The characteristics of the OH-58A during entry into autorotation were investigated and found to be acceptable. The aircraft reactions following an abrupt engine failure were examined by rapidly closing the throttle and attempting to hold all controls fixed for 2 seconds. Test results are shown in figures 29 and 30, appendix II. Although not shown in appendix II, the rotor rpm decay rate observed during these tests was excessive (approximately 22 rpm/sec). Normal power-on rpm was 354 and minimum power-off rpm was 330. In utilizing a 2-second delay, the minimum operational rpm (330) was exceeded under all conditions tested. The rotor speed at no time fell below the quoted safe transient value (304 rpm).

MISCELLANEOUS

Airspeed Calibration

19. Airspeed calibration tests were witnessed by USAASTA personnel during the FAA certification program. It was not deemed prudent or judicious to expend time conducting an airspeed calibration during the limited APE. The airspeed calibration curve used during this test program was provided by the manufacturer and is presented in figure 31, appendix II. The FAA approved SL V_{NE} is satisfactory for operational use (fig. 33).

Control System

20. The control system was evaluated while the aircraft was on the ground with the rotor stationary and hydraulic power off. Qualitatively, the cyclic control forces were considered acceptable. The longitudinal cyclic/collective stick control coupling was excessive. The collective required a 30-pound force to move it through full travel. Similar tests were conducted in flight with the hydraulic boost system turned off, and the results confirmed the unsatisfactory forces and control coupling. These characteristics comply with the detail specification and paragraph 3.5.8(a)(2) of MIL-H-8501A but do not comply with paragraphs 3.5.8(c) and 3.5.8(d), MIL-H-8501A. This condition is not considered a safety-of-flight hazard, but it would preclude successful mission accomplishment in the event of hydraulic boost failure. With the boost system turned on, these characteristics were not observed.

Rotor Characteristics

21. The manufacturer's recommended rotor-engagement wind limitations are unduly restrictive and unsatisfactory. A 30-knot maximum rotor engagement wind limitation and/or a 10-knot maximum gust spread is recommended. These limitations were imposed to preclude severe rotor mast bumping at low rotor rpm and fail to comply with paragraph 3.5.1, MIL-H-8501A.

Sideslip Limitations

22. The sideslip limitations observed during the APE were provided by the manufacturer. The sideslip envelope presented in figure 32, appendix II, is satisfactory for operational use but does not comply with paragraph 3.4.4.4 of the detail specification.

CONCLUSIONS

GENERAL

23. The following general conclusion was reached upon completion of the Army Preliminary Evaluation of the prototype OH-58A helicopter with the XM27E1 weapon subsystem: The overall handling qualities of the OH-58A are suitable for the armed scout mission.

DEFICIENCIES AND SHORTCOMINGS AFFECTING MISSION ACCOMPLISHMENT

24. Within the scope of this evaluation, no deficiencies were discovered.

25. Correction of the following shortcomings is desirable for improved operation and mission capabilities:

a. Unsatisfactory rotor-engagement wind tolerance (para 21).

b. Unsatisfactory boost-off characteristics (para 20).

SPECIFICATION COMPLIANCE

26. Within the scope of these tests, the stability and control characteristics of the OH-58A met the requirements of MIL-H-8501A with the exceptions listed below:

a. Paragraph 3.5.8(d). The force required on the collective stick exceeded 25 pounds (para 20).

b. Paragraph 3.5.8(c). The collective stick tended to creep during movement of the longitudinal cyclic with the hydraulic boost system turned off (para 20).

c. Paragraph 3.5.1. The rotor-engagement wind tolerance is below 45 knots (para 21).

d. Paragraph 3.3.15. Maximum roll rates exceeded 20 degrees-per-second-per-inch of control deflection (para 17).

e. Paragraph 3.3.2. The maximum allowable airspeed in sideward flight is less than 35 knots (para 22).

RECOMMENDATIONS

27. The shortcomings, correction of which is desirable, should be corrected on a high-priority basis.

APPENDIX I. REFERENCES

1. Letter, USAAVSCOM, AMSAV-R-FT, subject: USAAVSCOM Test Directive No. 68-41, OH-58A Monitor/APE, 29 April 1969.

2. Specification, Bell Helicopter Company, 206-947-031, *Light Observation Helicopter*, Model 206A (MOD) Revision No. R-4, 11 March 1969.

3. Military Specification, MIL-H-8501A, *Helicopter Flying and Ground Handling Qualities; General Requirements For*, 7 September 1961, with Amendment 1, 3 April 1962.

APPENDIX II. TEST DATA

FIGURE NO. 1

CONTROL POSITIONS IN LEVEL FLIGHT

OH-58A BELL S/N 69998

GROSS WEIGHT LBS.	LONG. C.G. STATION INCHES	LAT. C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
2950	107.8	-2.0	5000	564

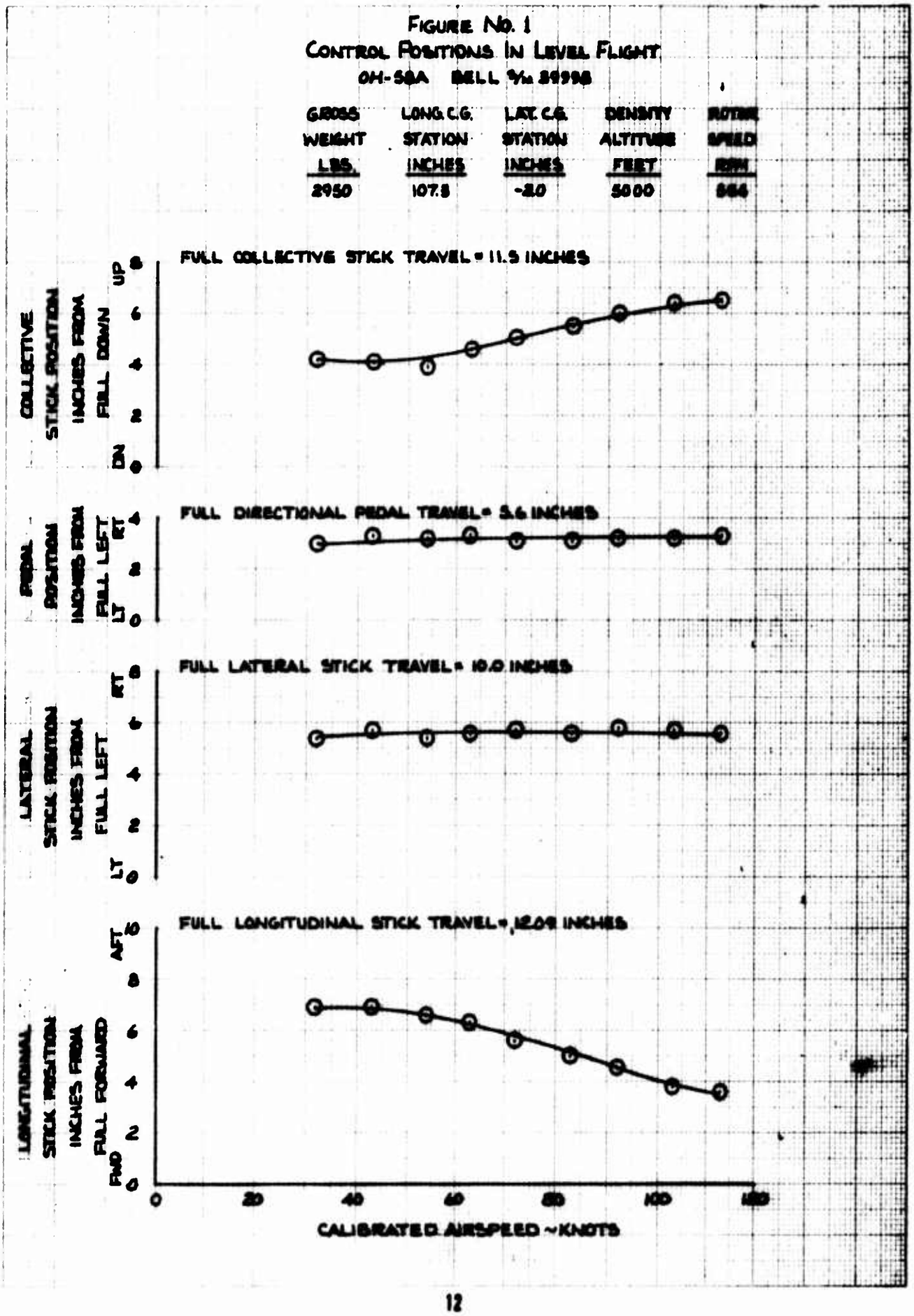


FIGURE No. 2

CONTROL POSITIONS IN LEVEL FLIGHT

OH-58A BELL S/N 69998

SYM	GROSS WEIGHT LBS.	LONG. C.G. STATION INCHES	LAT. C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
⊙	2935	106.2	-2.0	8000	384

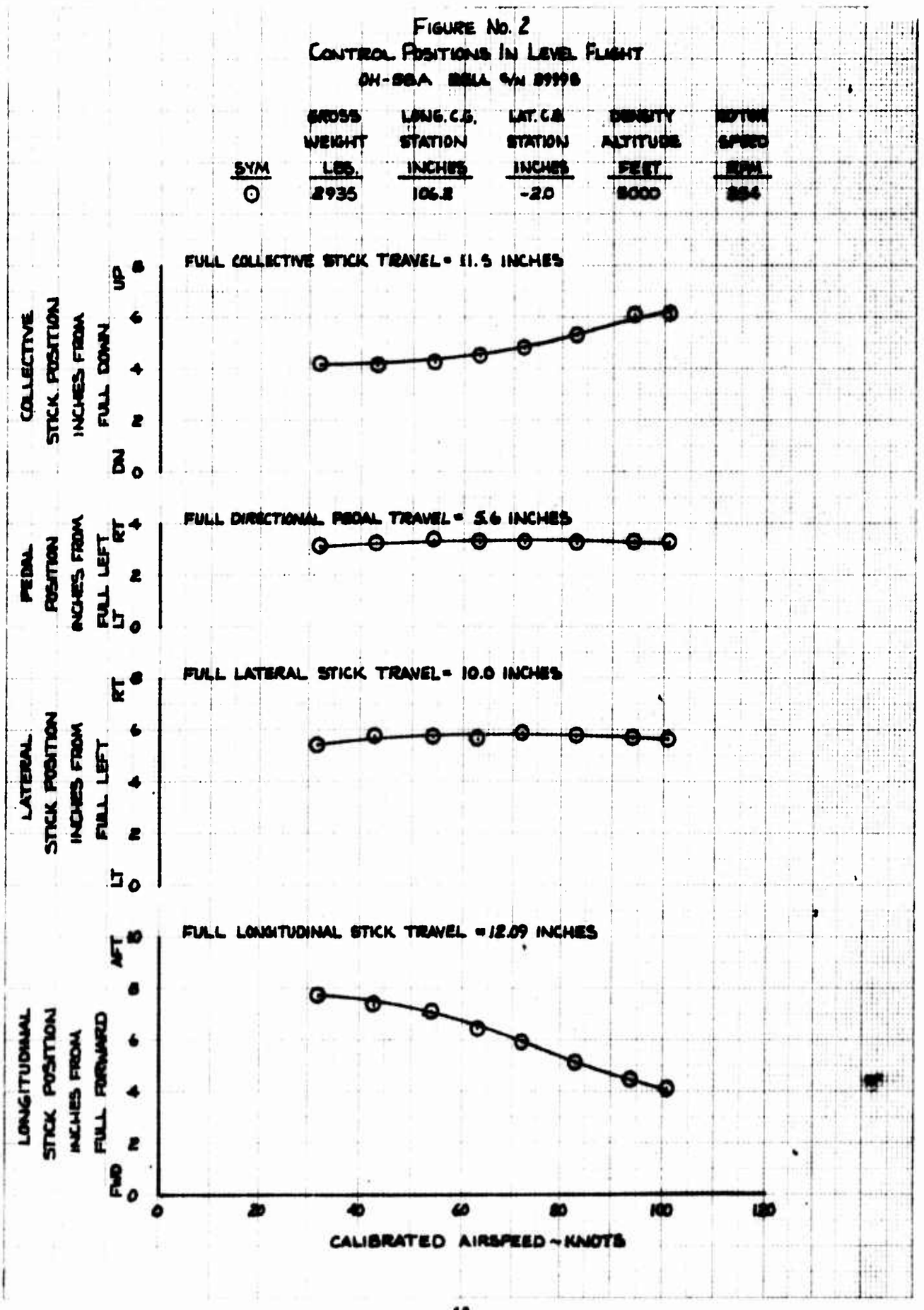


FIGURE No. 3

STATIC LONGITUDINAL STABILITY

LEVEL FLIGHT

OH-58A BELL S/N 39998

GROSS WEIGHT LBS	LONG. C.G. STATION INCHES	LAT. C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
2975	107.4	-2.0	5000	354

SHADED SYMBOLS DENOTE TRIM AIRSPEED

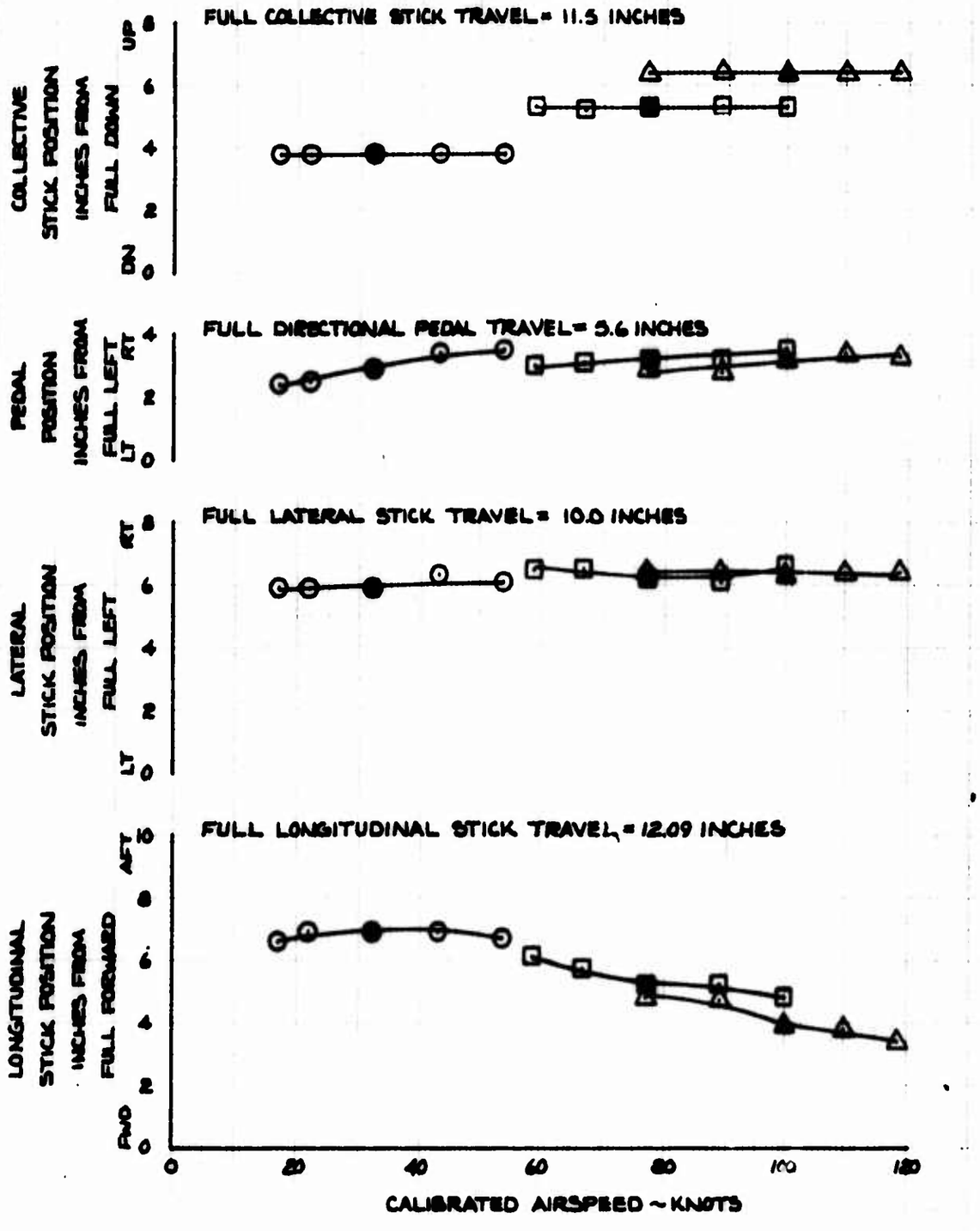


FIGURE No. 4

STATIC LONGITUDINAL STABILITY

OH-58A BELL NO. 39998

SYM	GROSS WEIGHT LBS	LONG.C.G. STATION INCHES	LAT.C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CONDITIONS
○	2945	107.3	-2.0	5000	354	CLIMB
△	2935	107.3	-2.0	5000	354	AUTO

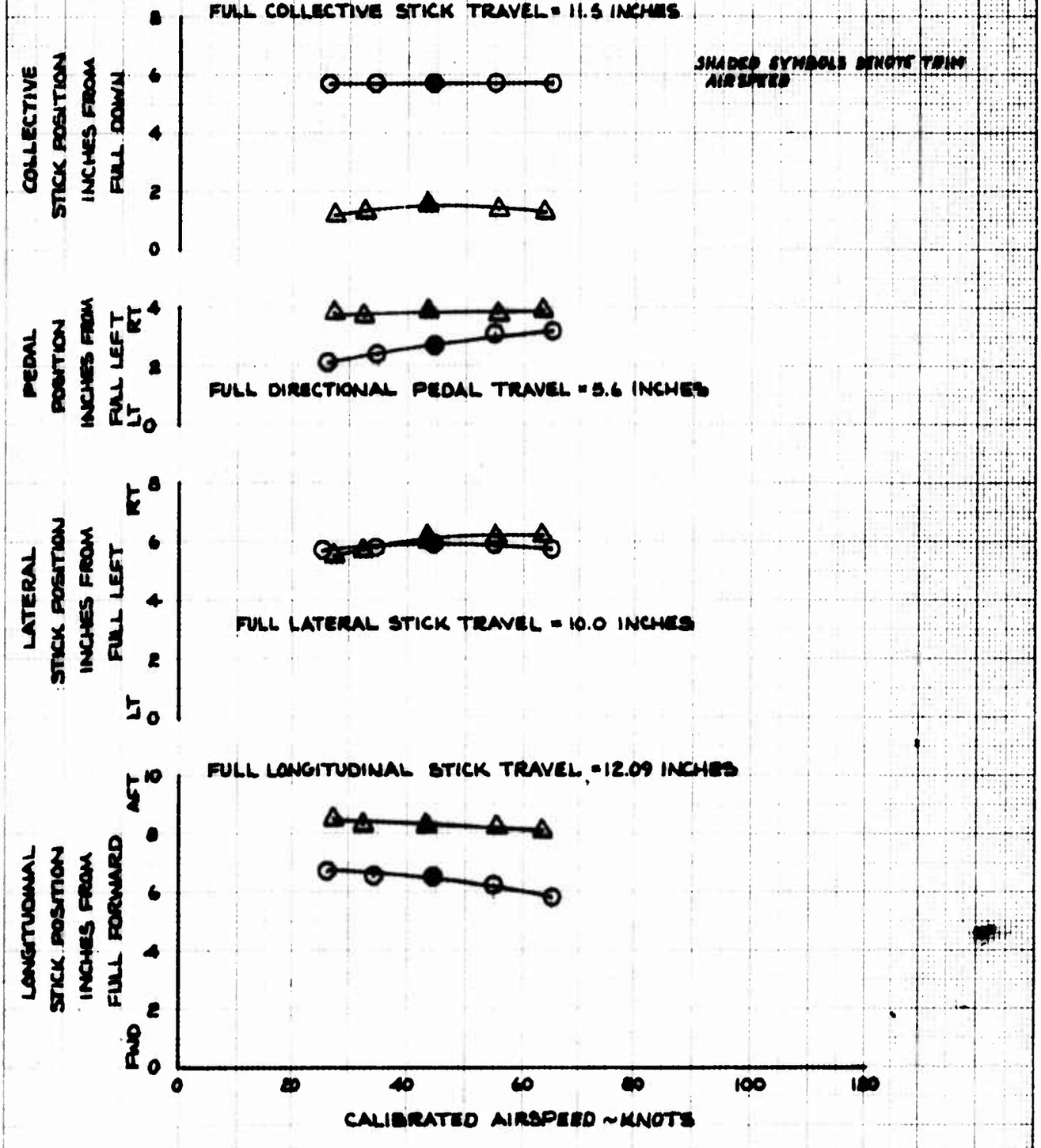


FIGURE NO. 5

STATIC LATERAL-DIRECTIONAL STABILITY

LEVEL FLIGHT

OH-58A BELL S/N 39998

GROSS WEIGHT LBS	LONG. C.G. STATION INCHES	LAT. C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
2975	107.3	-2.0	5000	354	32

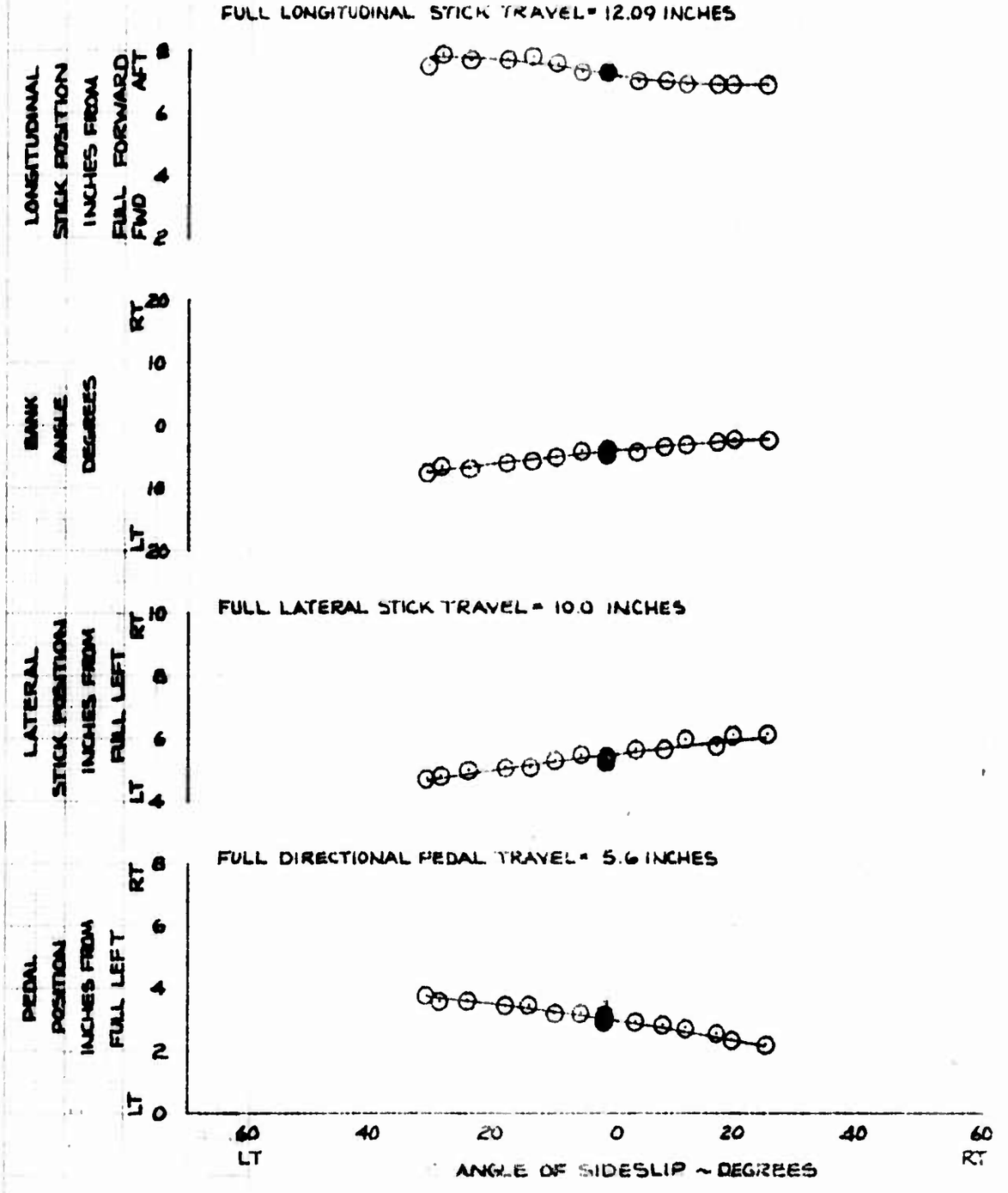


FIGURE NO. 6

STATIC LATERAL-DIRECTIONAL STABILITY

LEVEL FLIGHT

OH-58A BELL S/N 69998

GROSS WEIGHT LBS	LONG. C.G. STATION INCHES	LAT. C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	CALIBRATED AIRSPEED KNOTS
2945	107.3	-2.0	5000	354	78

SHADED SYMBOLS DENOTE TRIM AIRSPEED

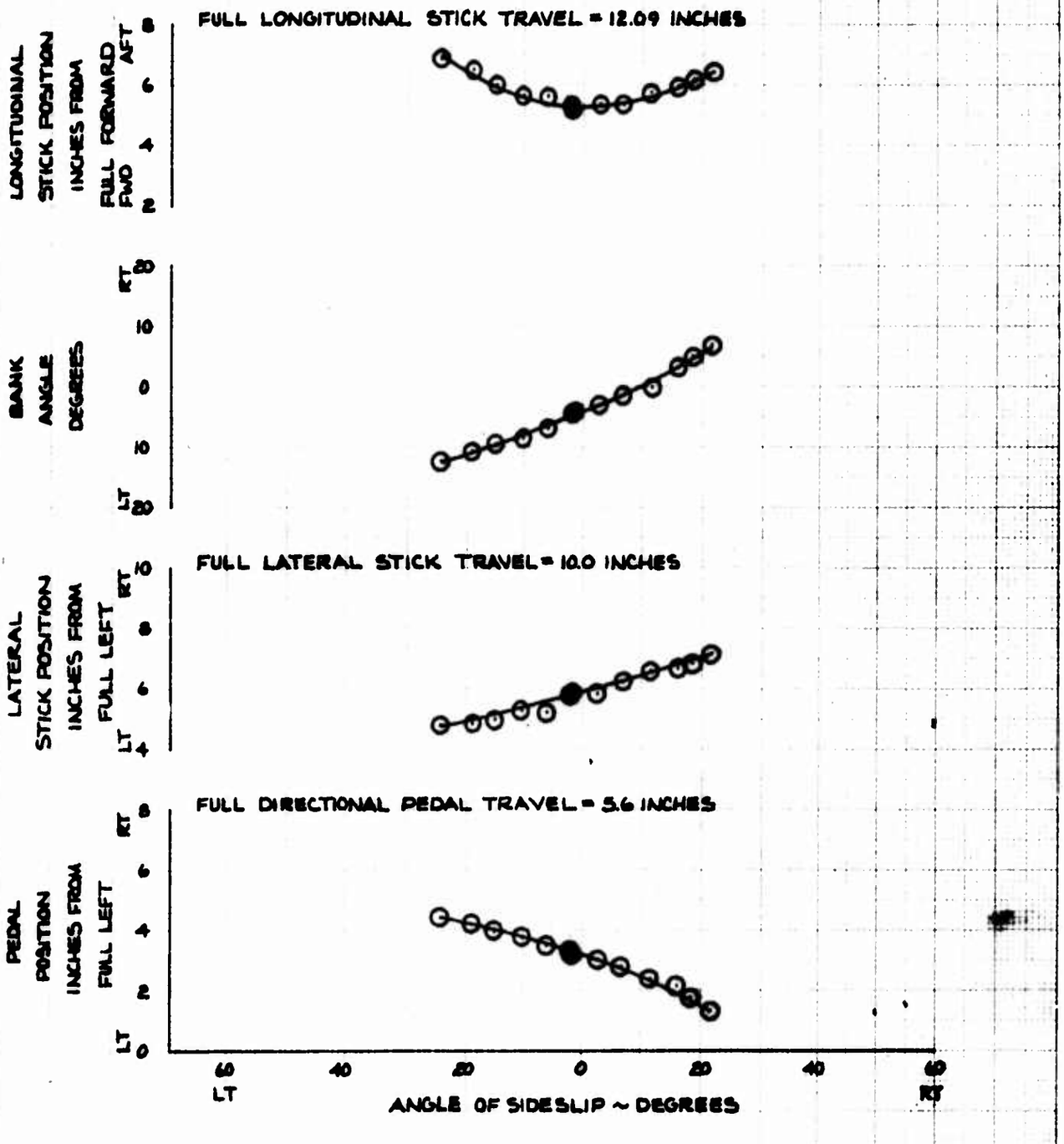


FIGURE No. 7

STATIC LATERAL - DIRECTIONAL STABILITY

LEVEL FLIGHT

OH-58A BELL 206B

GROSS WEIGHT LBS	LONG. C.G. STATION INCHES	LAT. C.G. STATION INCHES	DENSITY ALTITUDE FEET	INDICATED AIRSPEED KNOTS	CALIBRATED AIRSPEED KNOTS
2985	107.8	-2.0	5000	86.4	96

SHADED SYMBOLS DENOTE TRIM AIRSPEED

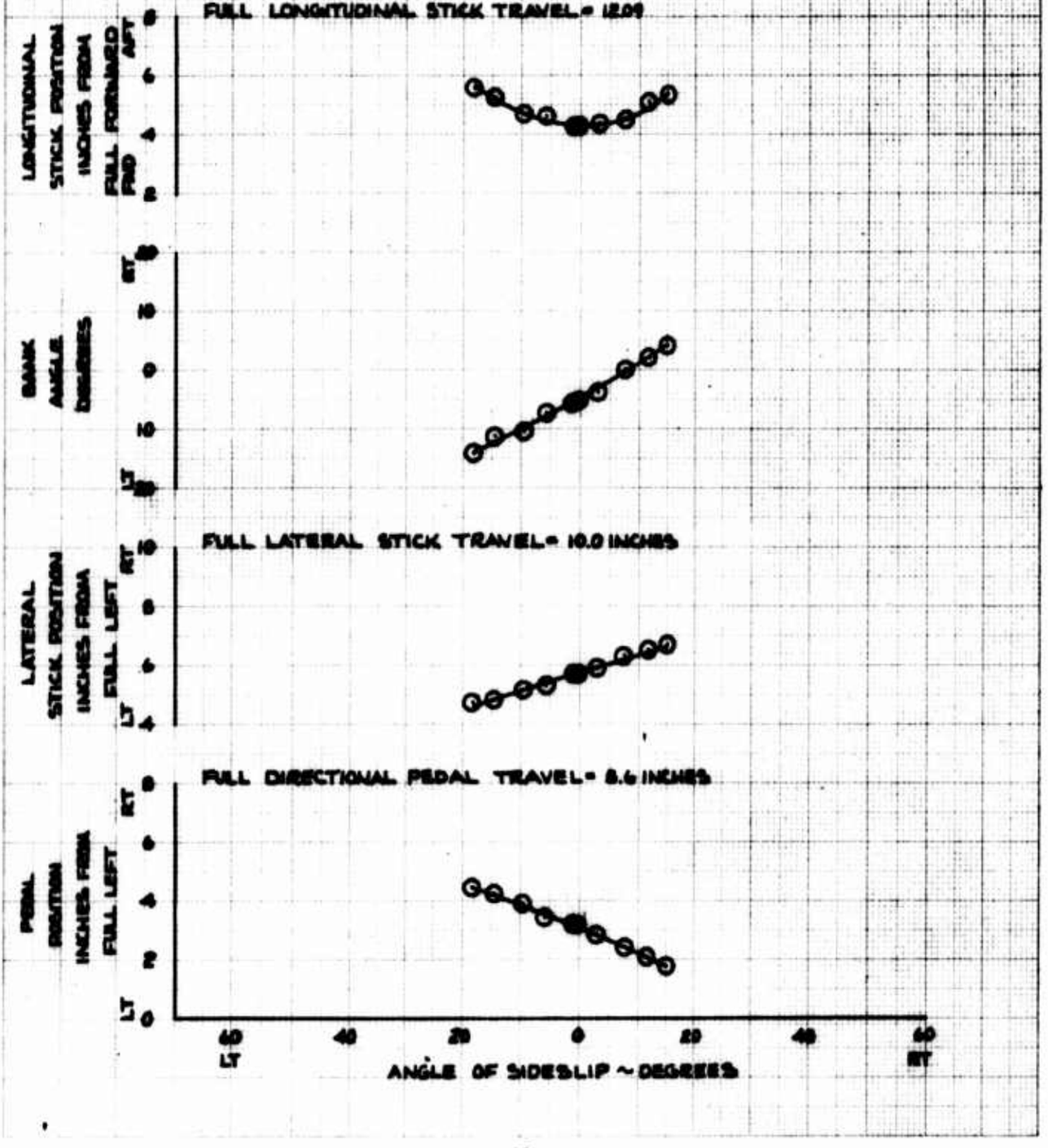


FIGURE NO. 6

CONTROL POSITIONS IN SIDEWARD FLIGHT

OH-58A BELL S/N 59998

GROSS WEIGHT LBS	LONG C.G. STATION INCHES	LAT C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
2990	106.3	-2.0	1940	394

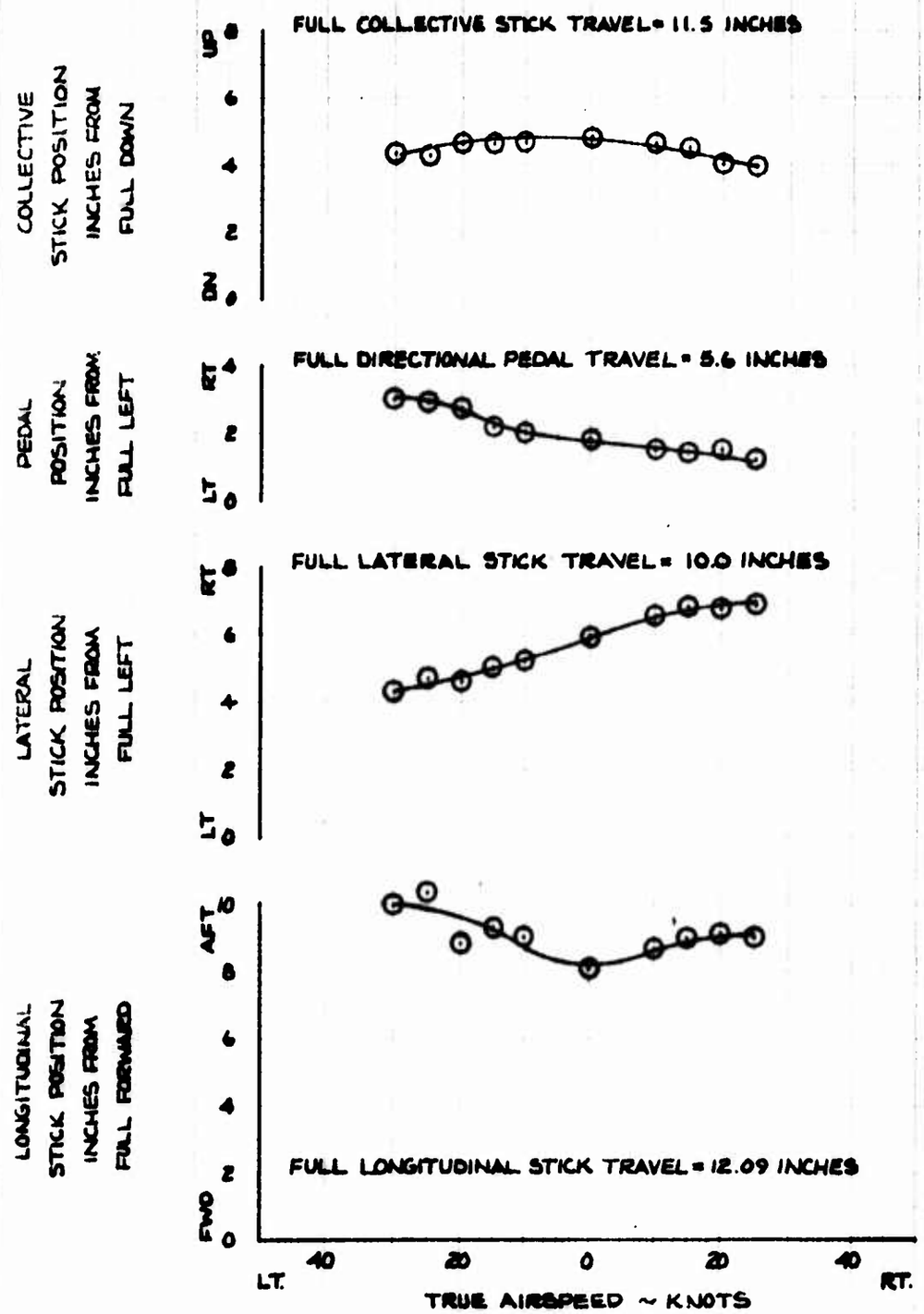


FIGURE NO. 9
CONTROL POSITIONS IN REARWARD FLIGHT
OH-58A BELL S/N 69998

GROSS WEIGHT LBS	LONG. C.G. STATION INCHES	LAT. C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
2985	106.3	-2.0	1940	354

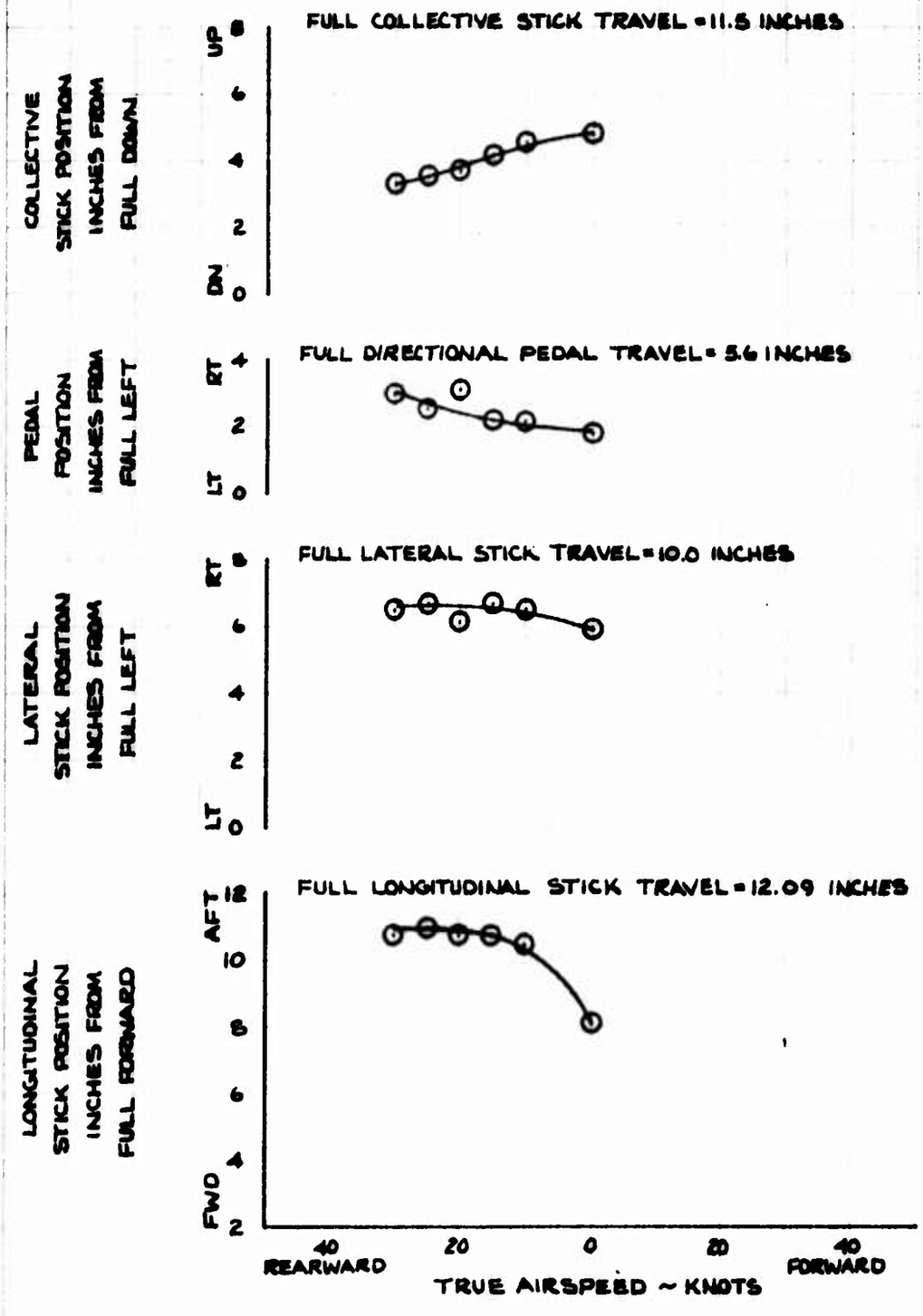


Figure No. 10
XM-27E-1 Firing Time Histories
OH-58A Bell S/N 39998

Hover

Gross Weight LBS	Long. C.G. Station Inches	Lat. C.G. Station Inches	Density Altitude Feet	Rotor Speed RPM	Trim Airspeed Knots	XM-134 Minigun Position	Firing Rate SPM	Sideslip Angle Degrees
2985	77	-1.4	2270	354	0	MAX. UP	4000(HIGH)	N/A

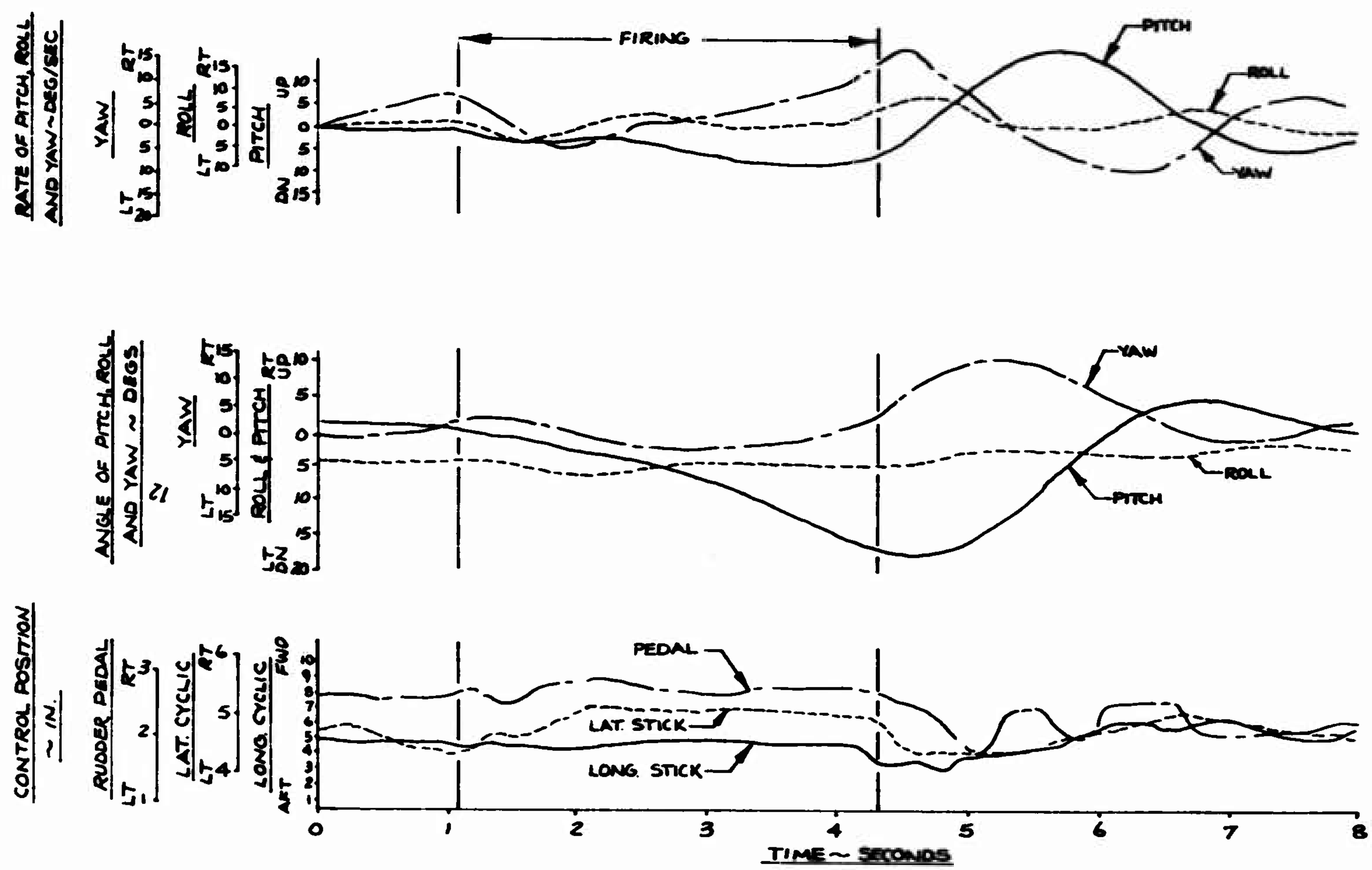


FIGURE NO. 11

XM-27E1 FIRING TIME HISTORIES

OH-58A BELL S/N 39998

LEVEL FLIGHT

GROSS WEIGHT LBS	LONG. C.G. STATION INCHES	LAT. C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	TRIM AIRSPEED KNOTS	XM-134 MINIGUN POSITION	FIRING RATE SPM	SIDESLIP ANGLE DEGREES
2980	107.7	-1.4	1860	354	32 KCAS	STOWED	4000 (HIGH)	32 B RT

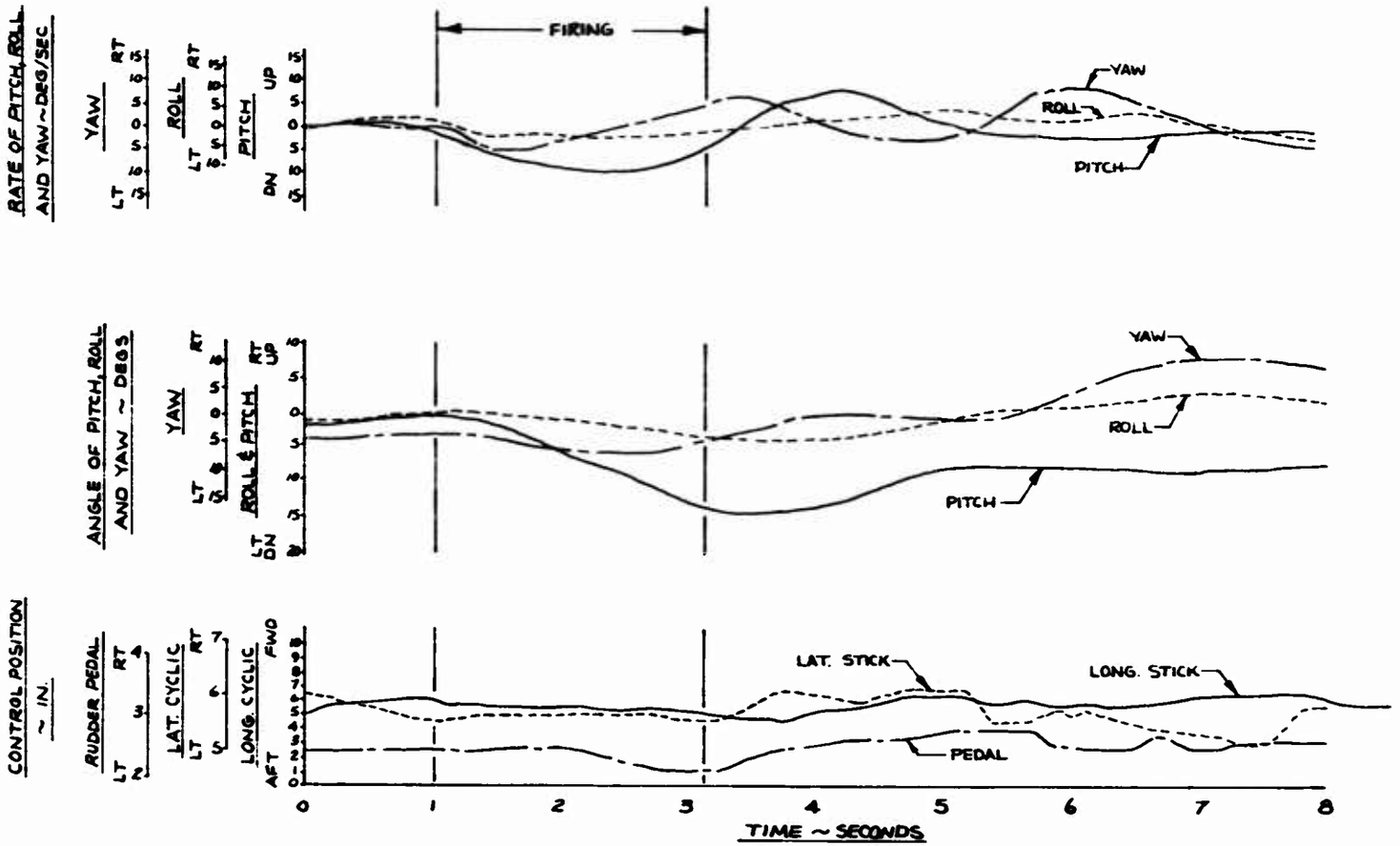


FIGURE No. 12

XM-27E1 FIRING TIME HISTORIES

OH-58A BELL S/N 39992

LEVEL FLIGHT

GROSS WEIGHT LBS	LONG. C.G. STATION INCHES	LAT. C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	TRIM AIRSPEED KNOTS	XM-134 MINIGUN POSITION	FIRING RATE SPM	SIDESLIP ANGLE DEGREES
2960	107.6	-1.4	1860	354	48 KCAS	MAX DWN	4000 (HIGH)	25.8 RT

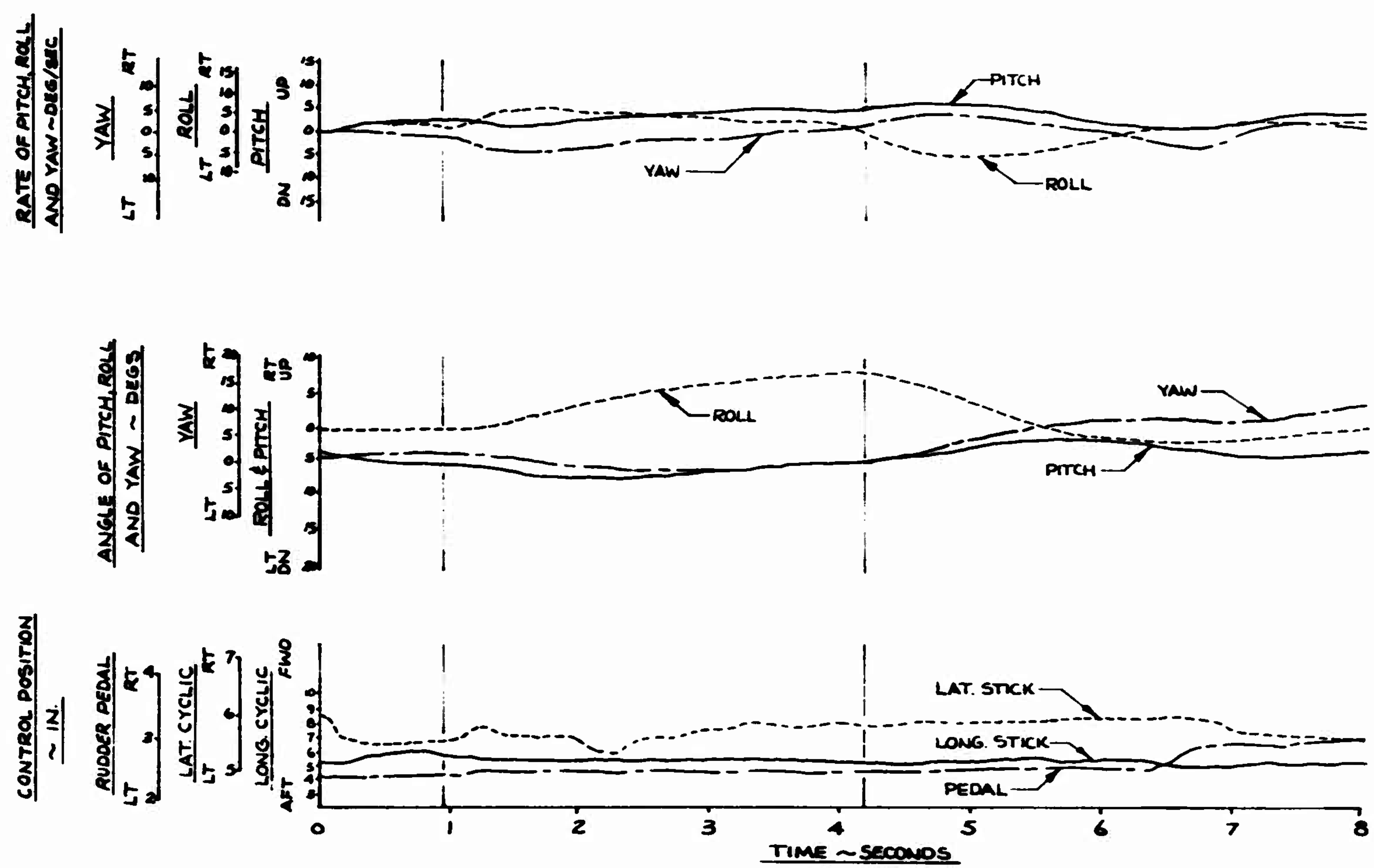


FIGURE NO. 13

XM27E1 FIRING TIME HISTORIES

OH-58A BELL S/N 39998

LEVEL FLIGHT

GROSS WEIGHT LBS	LONG. C.G. STATION INCHES	LAT. C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	TRIM AIRSPEED KNOTS	XM-134 MINIGUN POSITION	FIRING RATE SPM	SIDESLIP ANGLE DEGREES
2995	107.7	-1.4	2220	354	100 KCAS	STOWED	4000(HIGH)	20.3 RT

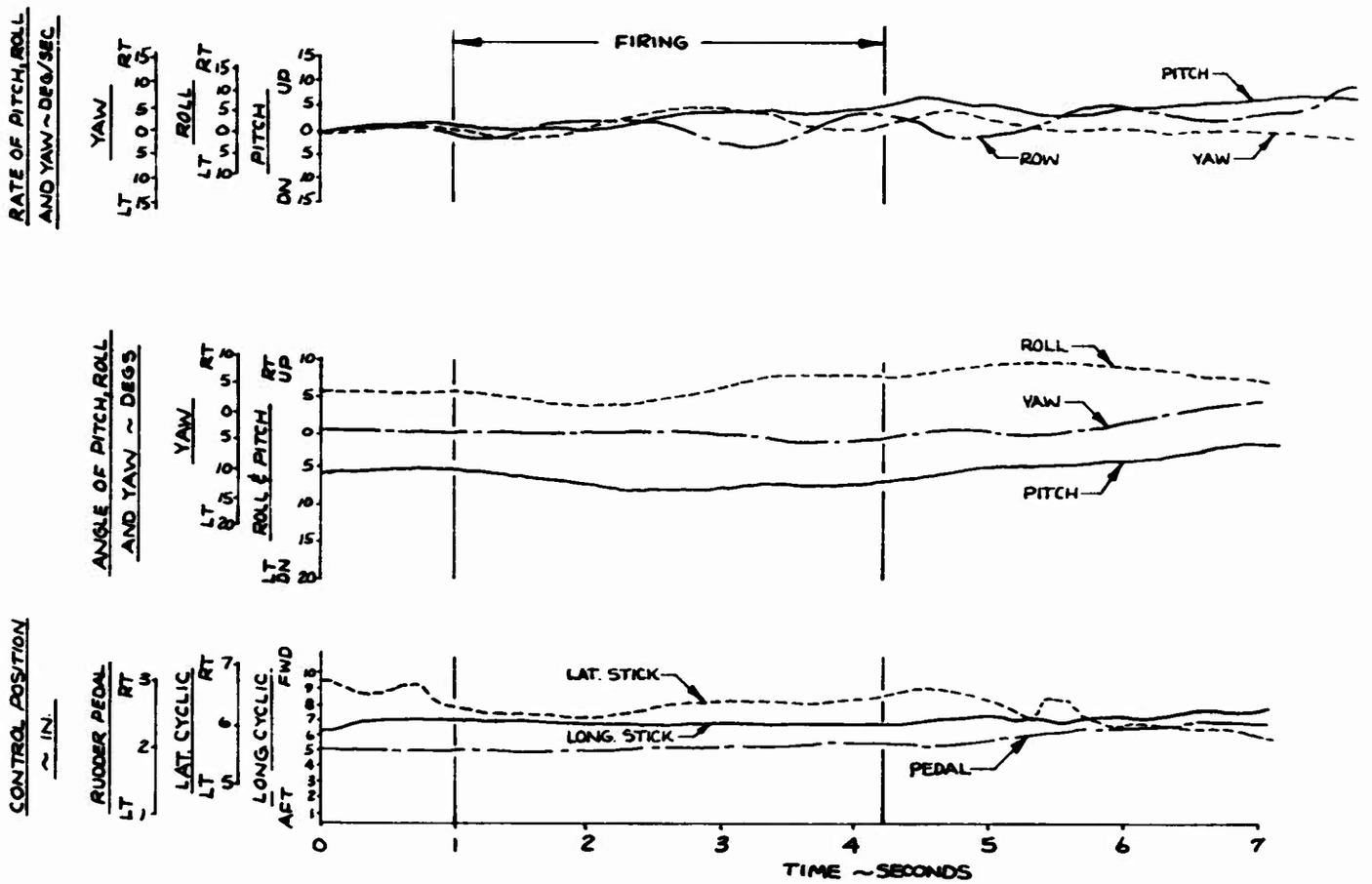


FIGURE NO 14

XM-27E1 FIRING TIME HISTORIES

OH-58A BELL S/N 39998

HIGH POWER DESCENT R/D = 2500 FT./MIN.

GROSS WEIGHT LBS	LONG.C.G. STATION INCHES	LAT.C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM	TRIM AIRSPEED KNOTS	XM-134 MINIGUN POSITION	FIRING RATE SPM	SIDESLIP ANGLE DEGREES
3000	107.7	-1.4	2360	354	121 KCAS	STOWED	4000 (HIGH)	0.50 LT

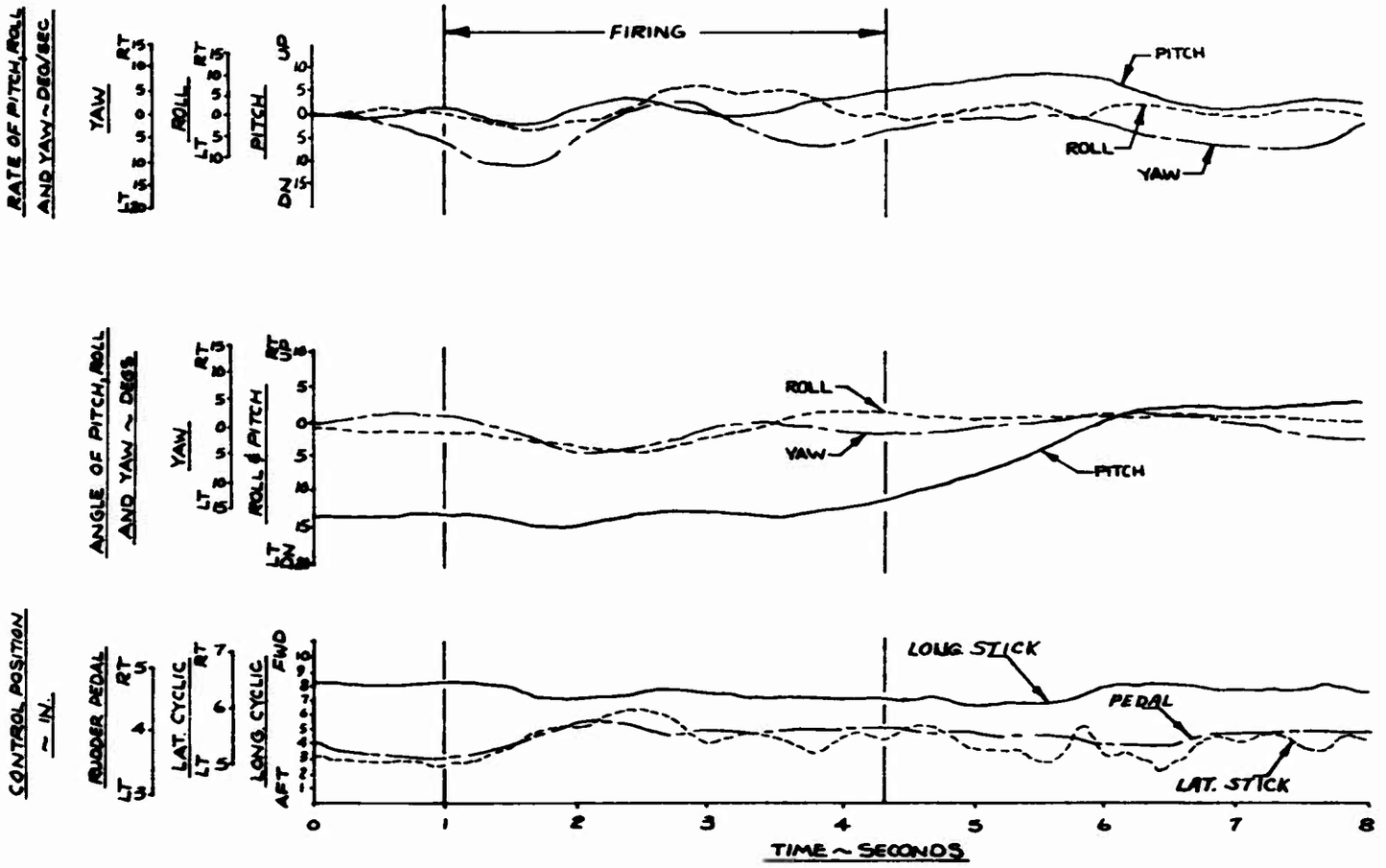


Figure No 15

Right Lateral Dynamic Stability

Level Flight

OH-58A Bell S/N 39998

Gross Weight LBS	Long C.G Station Inches	Lat C.G Station Inches	Rotor Speed RPM	Density Altitude Feet	Trim Airspeed Knots
2900	107.2	-2.0	354	5000	98 KCAS

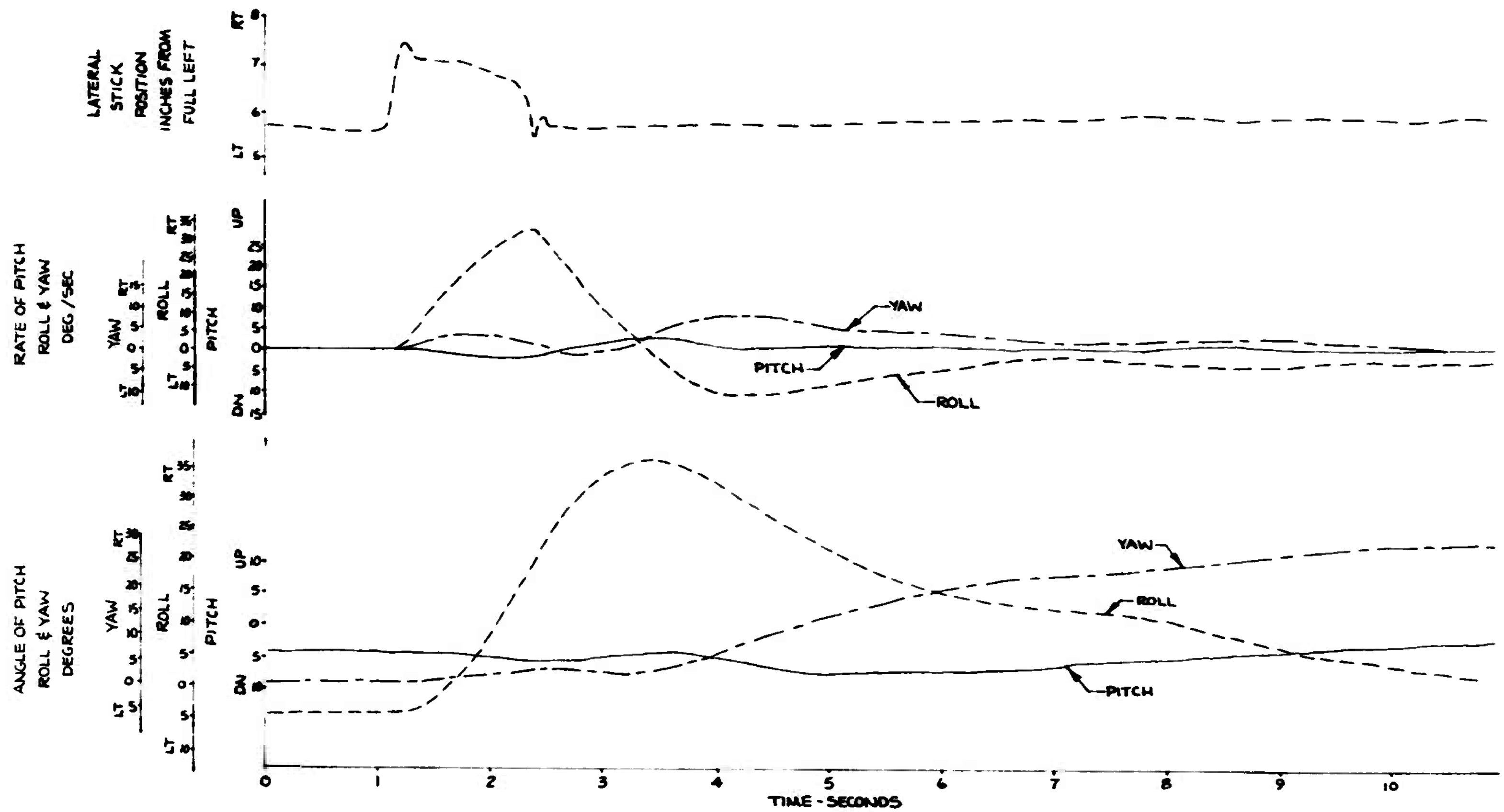


Figure No. [illegible]
Left Directional Dynamic Stability
Level Flight
OH-58A Bell S/N 39998

Gross Weight LBS	Long C.G. Station Inches	Lat. C.G. Station Inches	Rotor Speed RPM	Density Altitude Feet	Trim Airspeed Knots
2870	107.2	-2.0	354	5000	77 KCAS

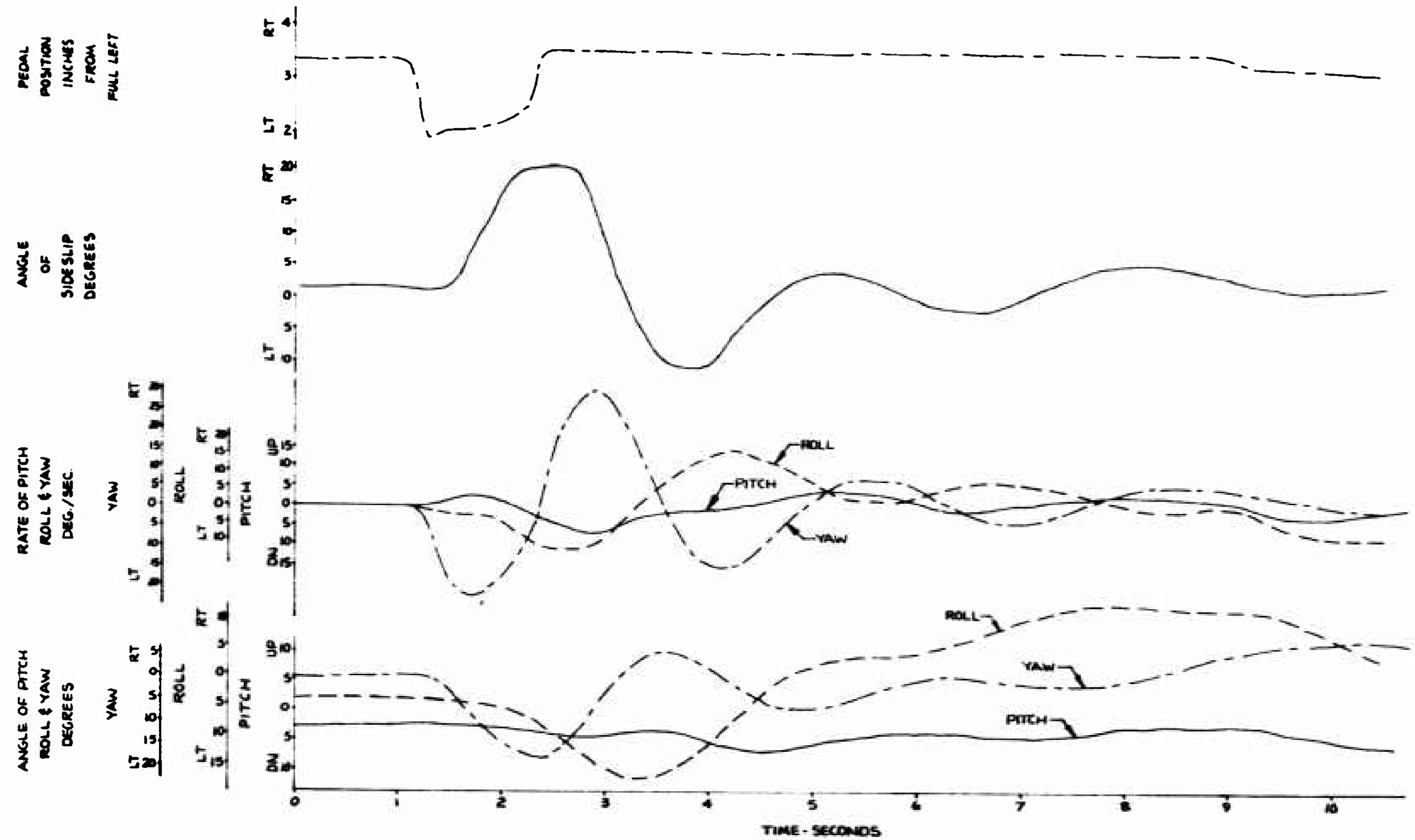


FIGURE NO. 17
LONGITUDINAL CONTROL RESPONSE
HOVER

OH-58A BELL S/N 39998

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	LONG. C.G. STATION INCHES	LAT. C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
0	2960	106.3	-2.0	1840	354

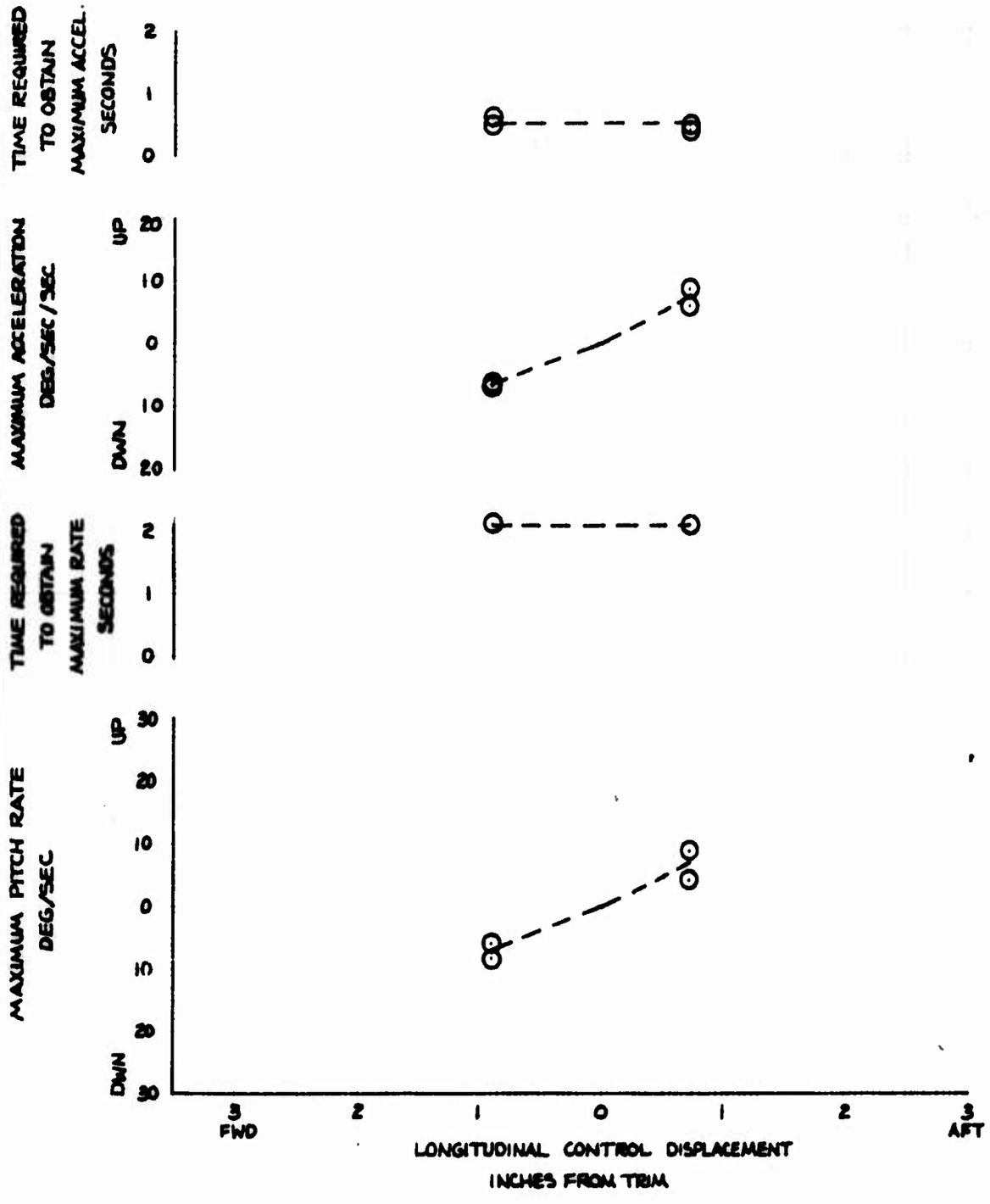


FIGURE No. 18

LATERAL CONTROL RESPONSE

HOVER

OH-58A BELL No. 39998

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS.	LONG. C.G. STATION INCHES	LAT. C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
0	2945	106.3	-2.0	1840	354

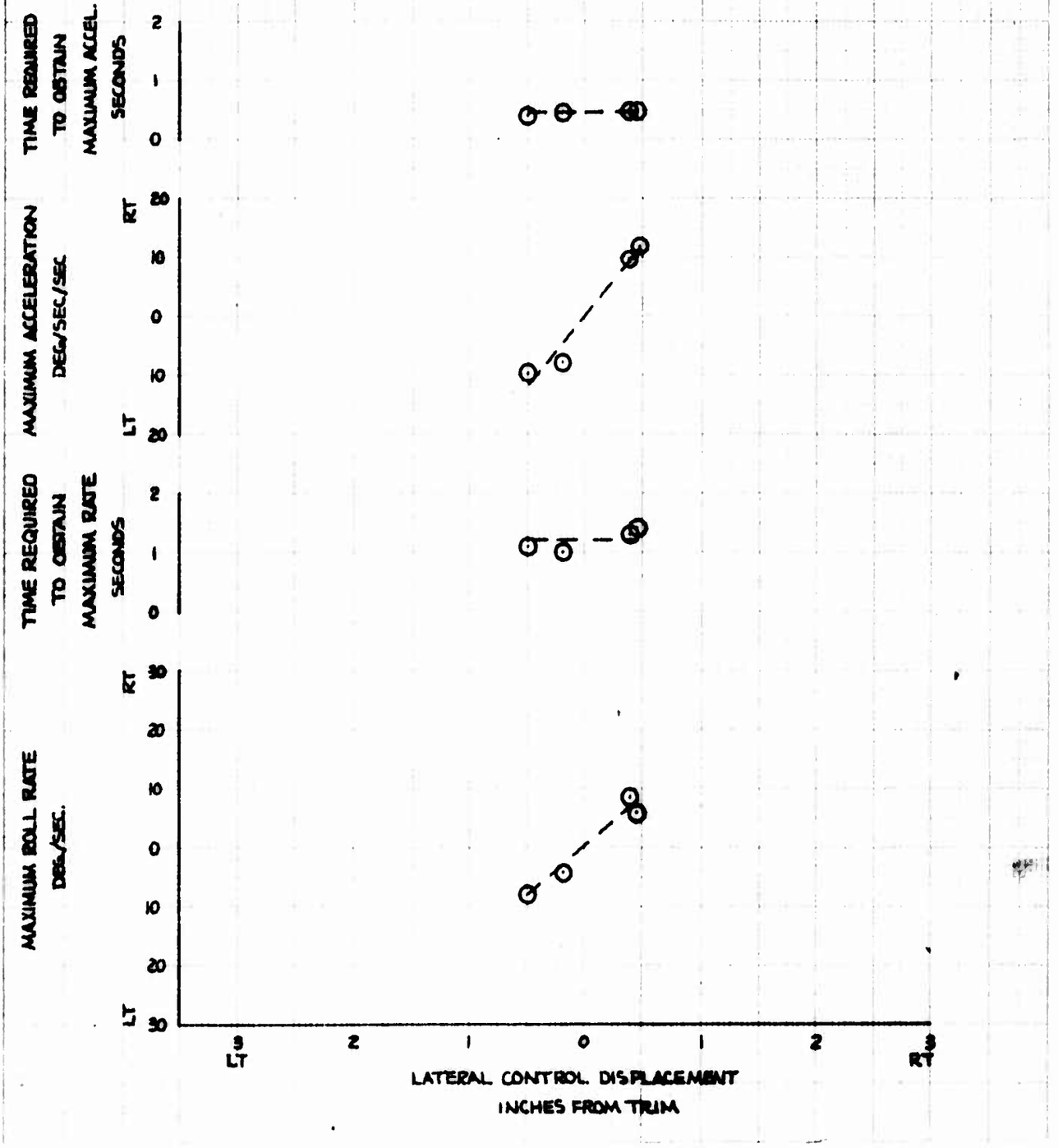


FIGURE No. 19

DIRECTIONAL CONTROL RESPONSE

HOVER

OH-58A BELL S/N 69198

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS.	LONG. C.G. STATION INCHES	LAT. C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
0	2925	106.3	-2.0	1840	354

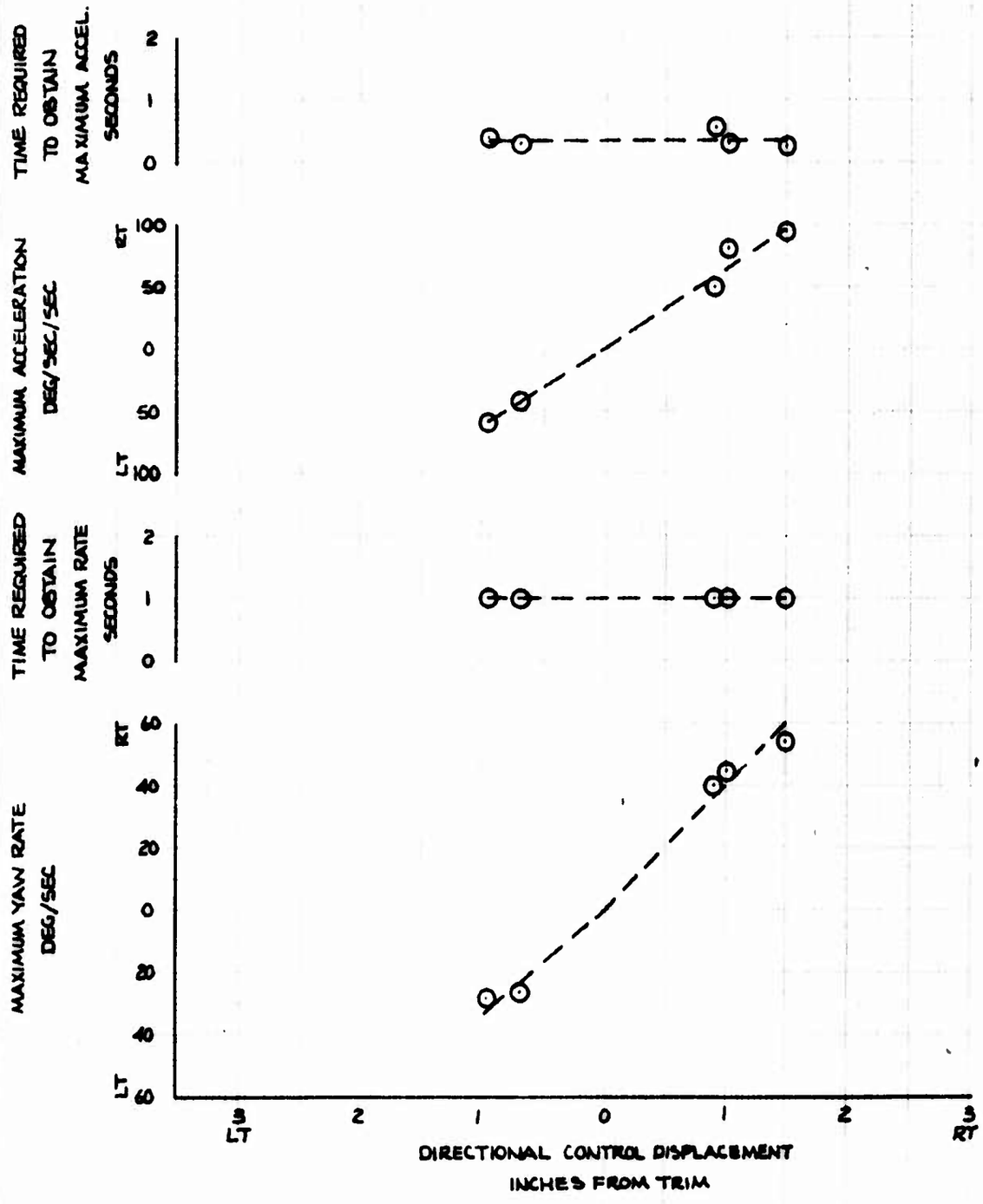


FIGURE No. 20

LONGITUDINAL CONTROL RESPONSE

LEVEL FLIGHT

OH-58A BELL No. 69998

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS.	LONG.C.G. STATION INCHES	LAT.C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
48	2980	107.3	-2.0	5000	354

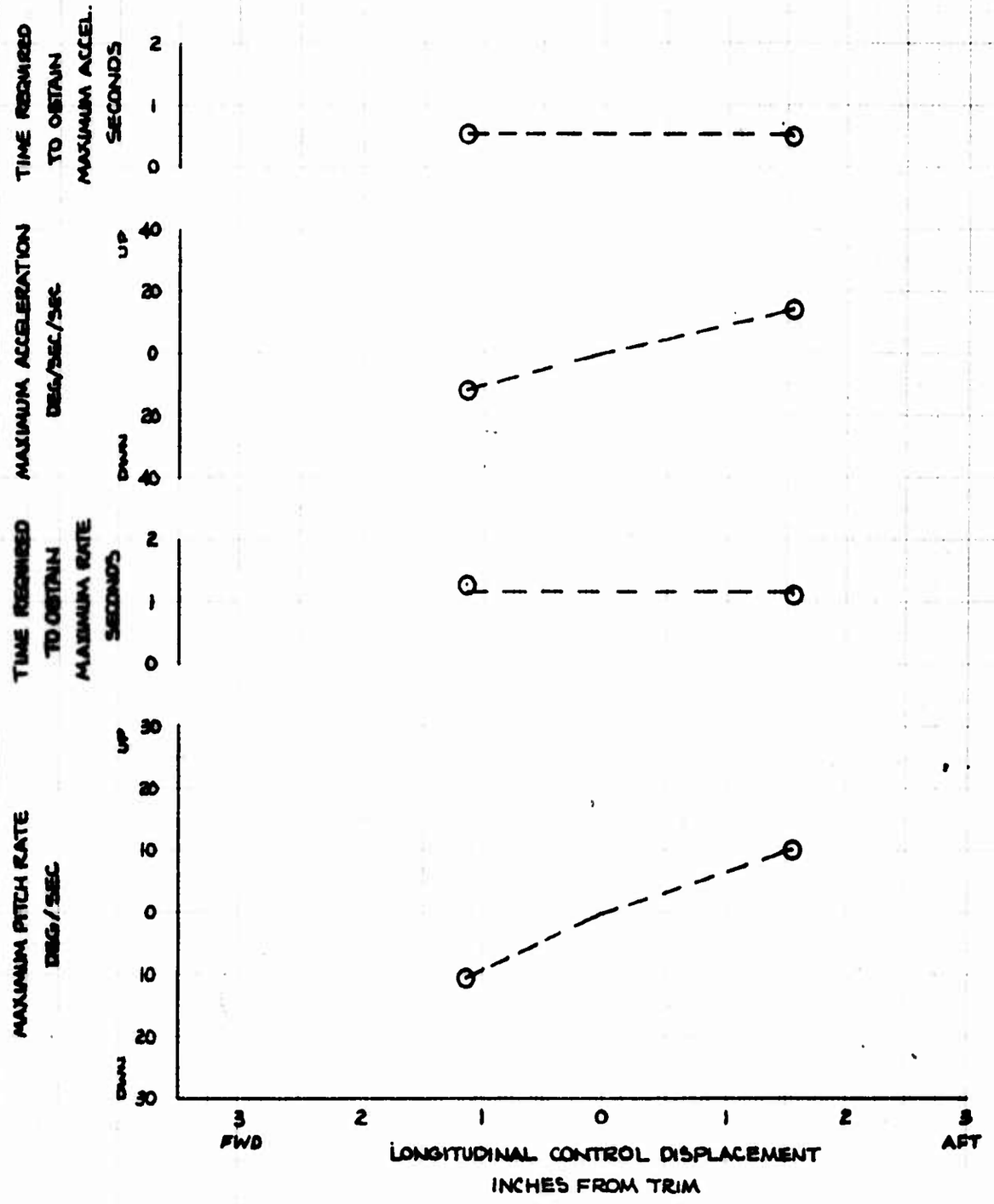


FIGURE No. 21

LATERAL CONTROL RESPONSE

LEVEL FLIGHT

OH-58A BELL No. 69998

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS.	LONG. C.G. STATION INCHES	LAT. C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
46	2980	107.3	-2.0	5000	354

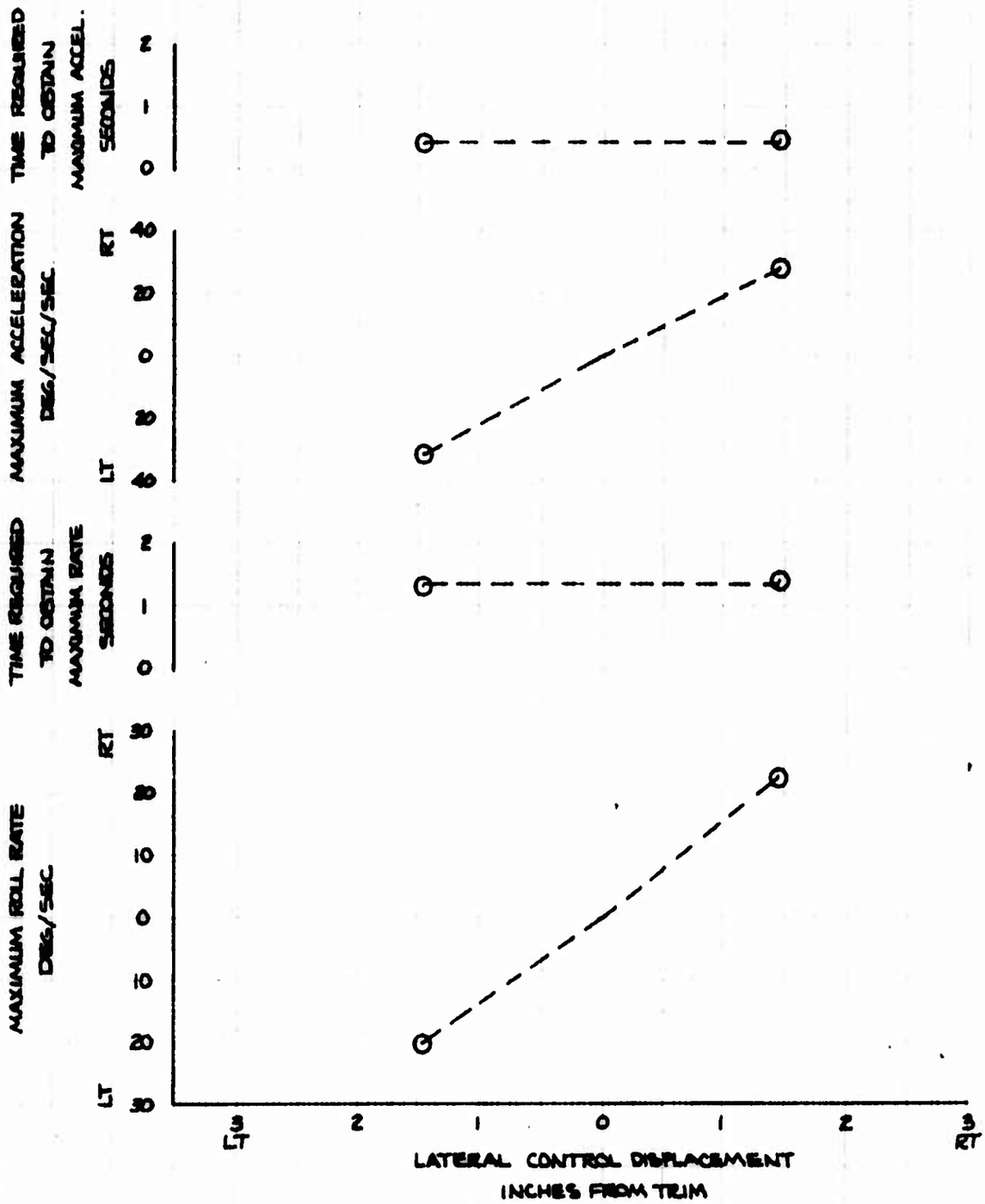


FIGURE No. 22
DIRECTIONAL CONTROL RESPONSE
LEVEL FLIGHT
OH-58A BELL S/N 39998

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS.	LONG.C.G. STATION INCHES	LAT.C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
48	2980	107.3	-2.0	5000	354

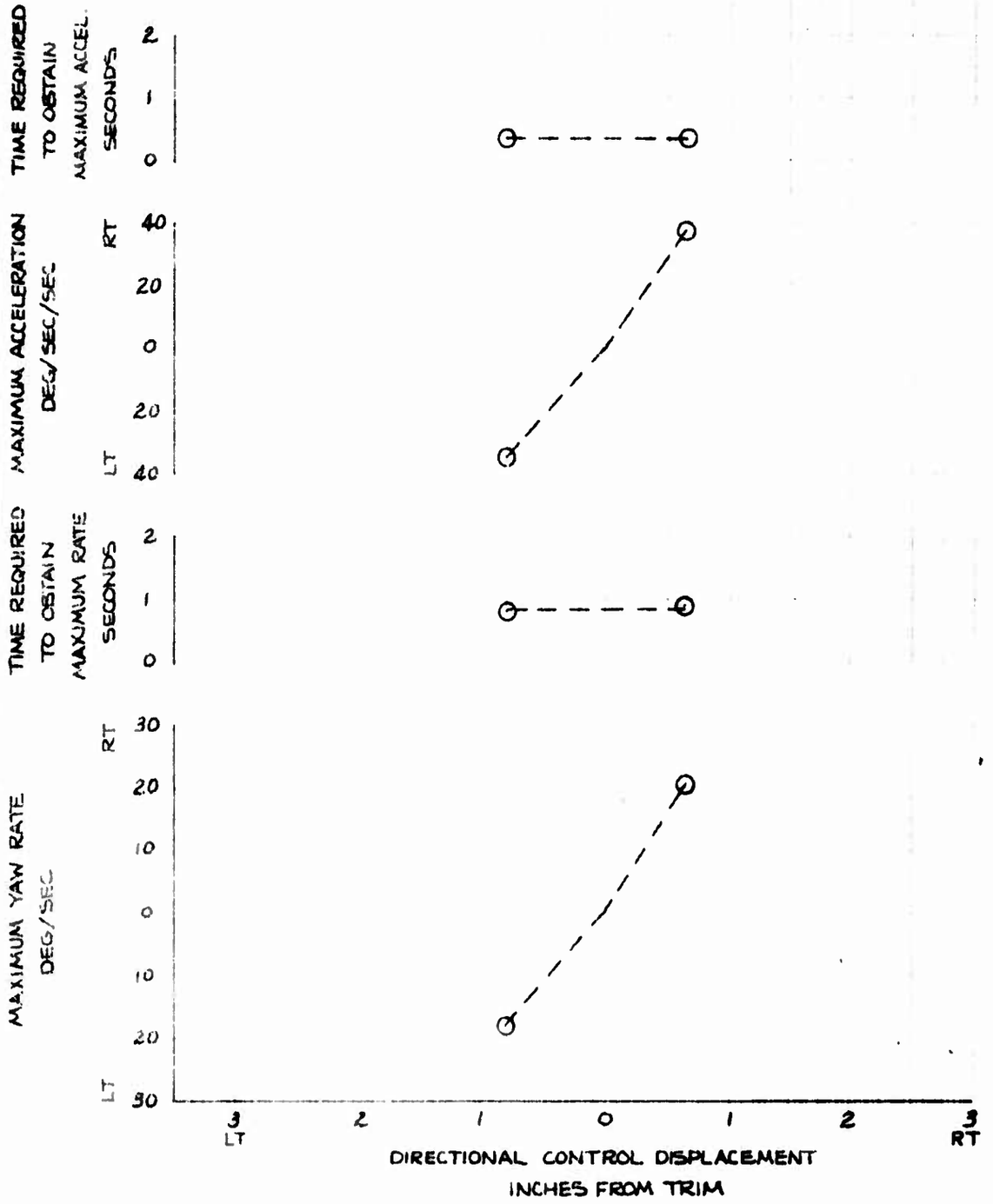


FIGURE NO. 23

LONGITUDINAL CONTROL RESPONSE

LEVEL FLIGHT

OH-58A BELL No. 59095

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS.	LONG. C.G. STATION INCHES	LAT. C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
77	2955	107.3	-2.0	5000	354

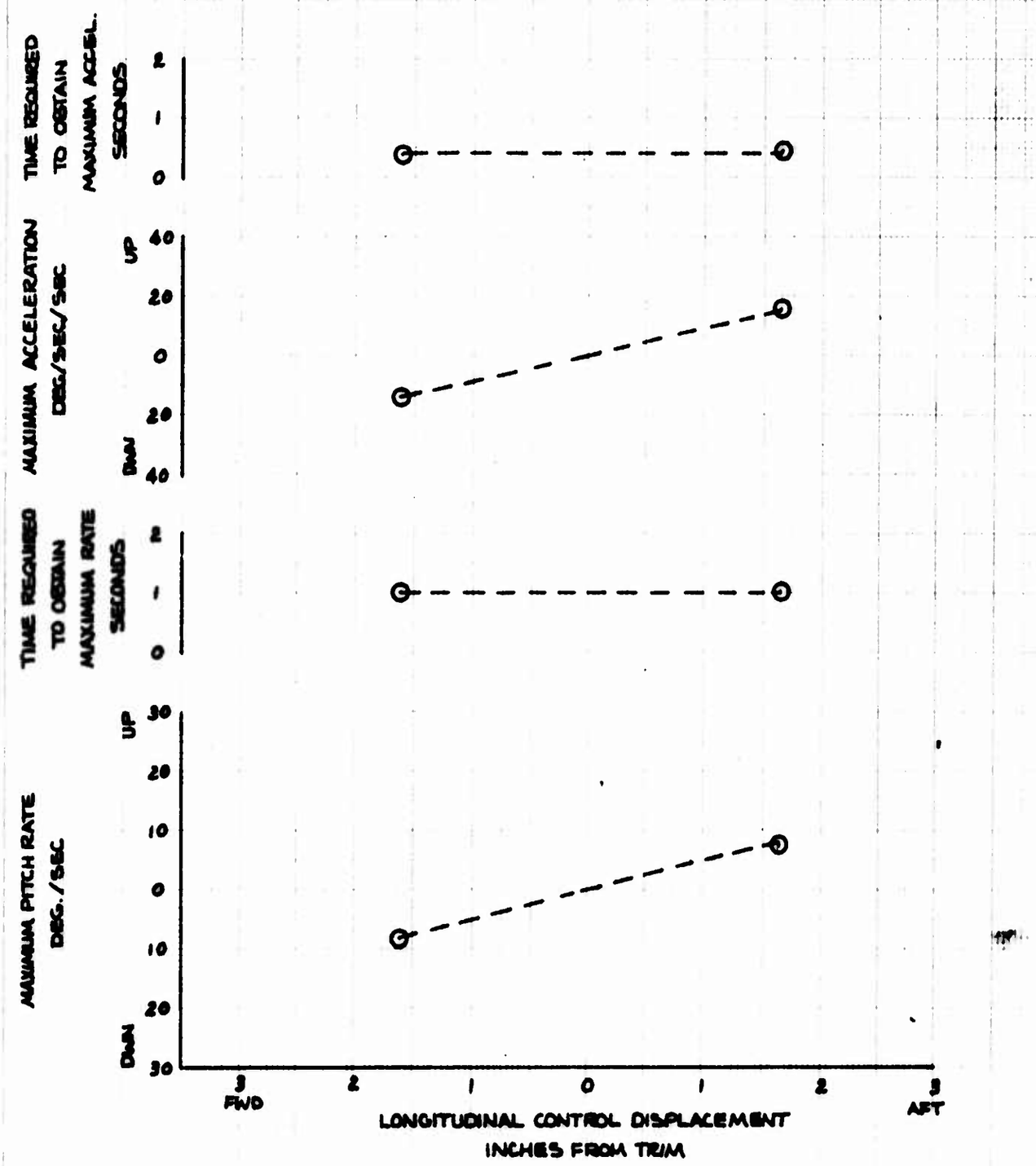


FIGURE No. 24
LATERAL CONTROL RESPONSE
LEVEL FLIGHT
OH-58A BELL S/N 39998

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	LONG.C.G. STATION INCHES	LAT.C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
77	2955	107.3	-2.0	5000	354

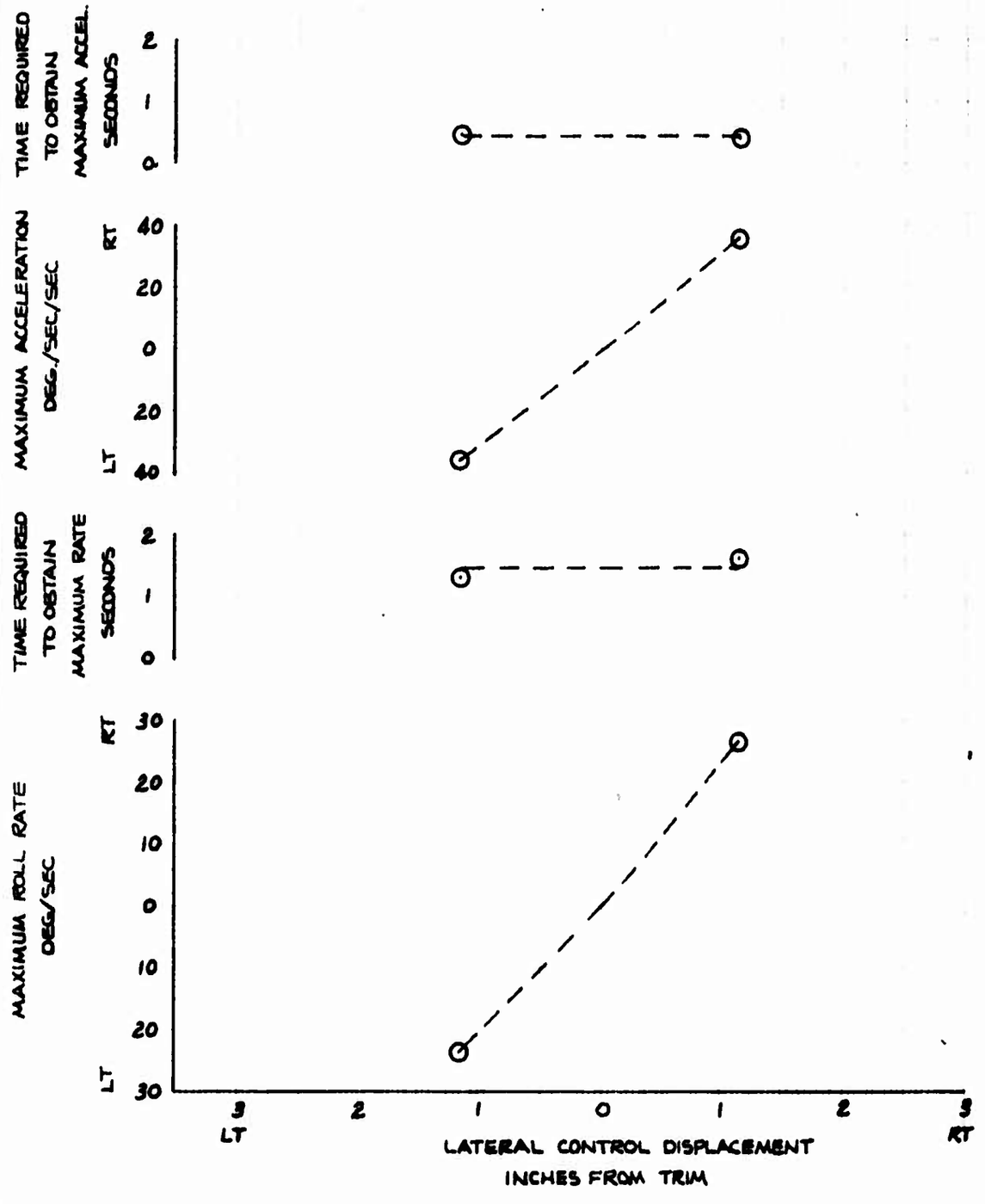


FIGURE No. 25

DIRECTIONAL CONTROL RESPONSE

LEVEL FLIGHT

OH-58A BELL S/N 21998

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	LONG.C.G. STATION INCHES	LAT.C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
77	2955	107.3	-2.0	5000	354

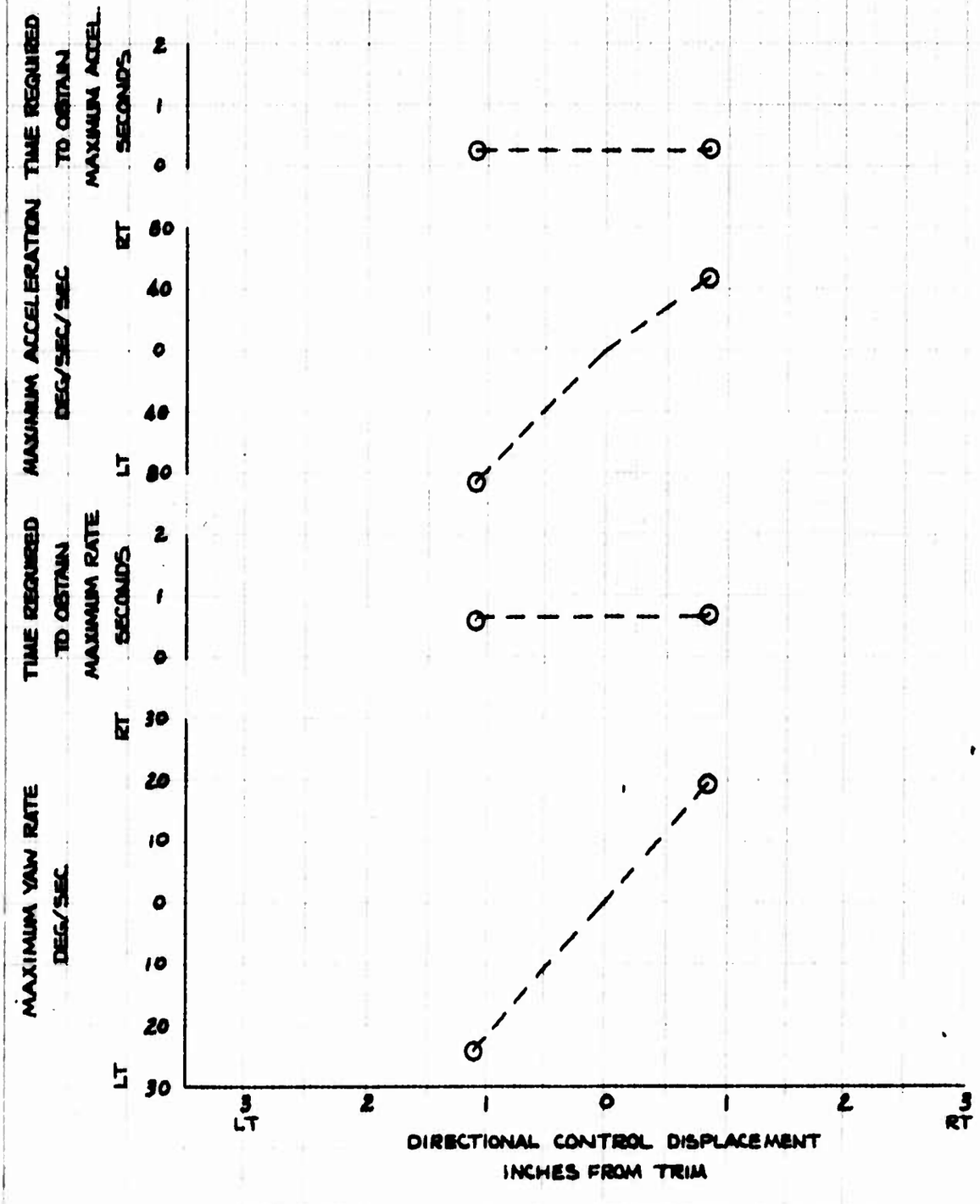


FIGURE NO. 26

LONGITUDINAL CONTROL RESPONSE

LEVEL FLIGHT

OH-58A BELL S/N 69918

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS.	LONG.C.G. STATION INCHES	LAT.C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
98	2920	107.3	-2.0	5000	354

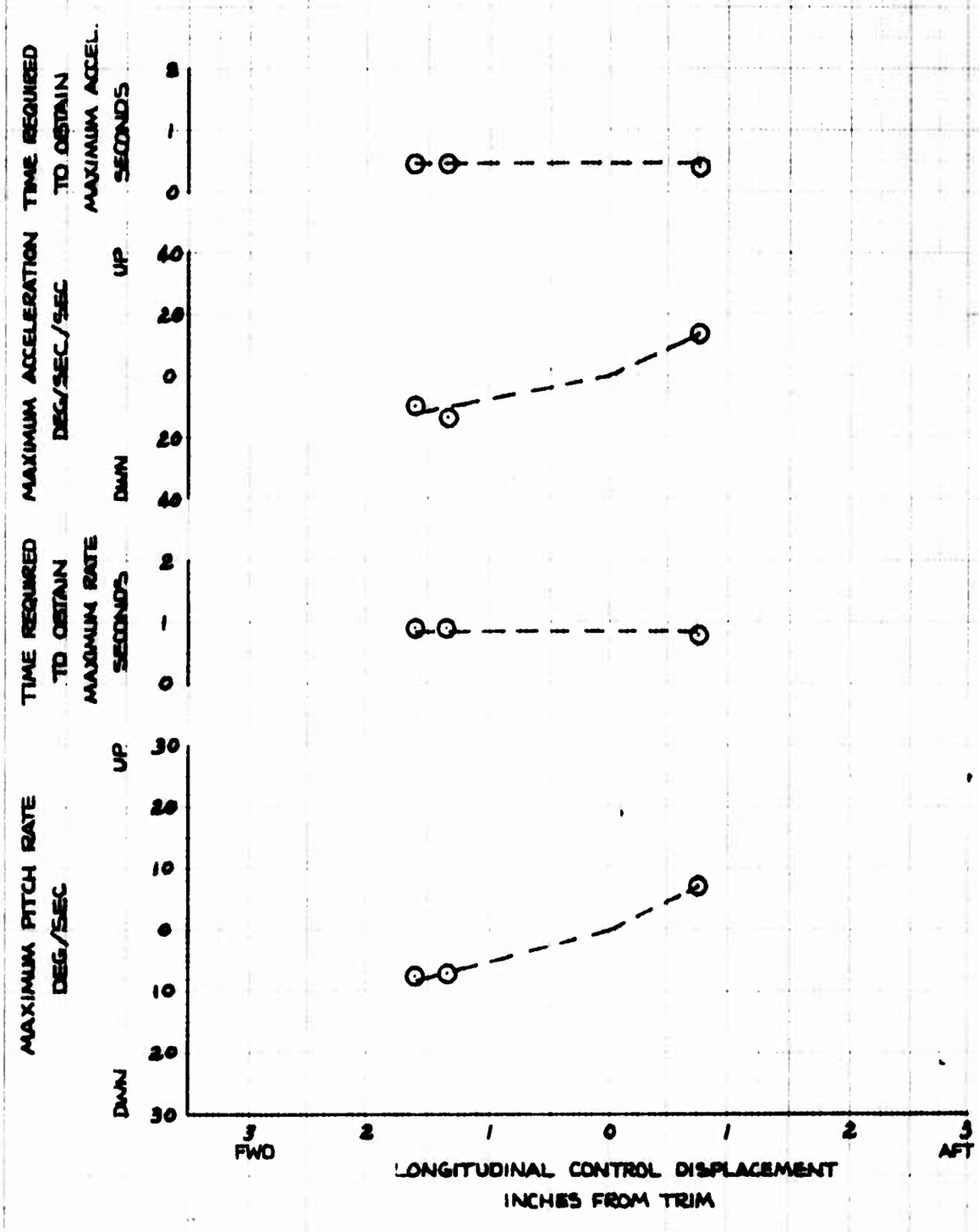


FIGURE No. 27

LATERAL CONTROL RESPONSE

LEVEL FLIGHT

OH-58A BELL SN 69998

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS.	LONG. C.G. STATION INCHES	LAT. C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
98	2920	107.3	-2.0	5000	354

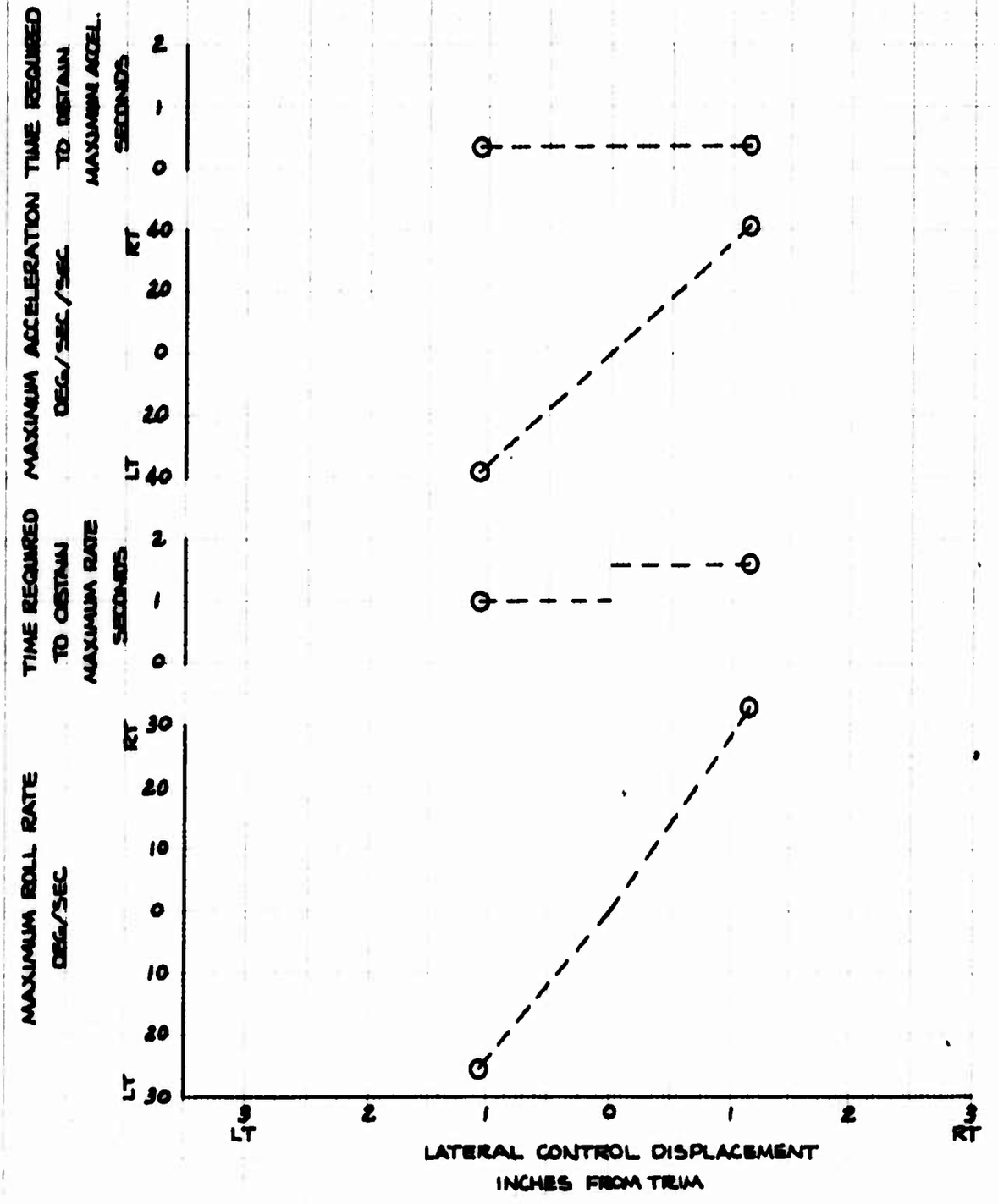


FIGURE No. 28

DIRECTIONAL CONTROL RESPONSE

LEVEL FLIGHT

OH-58A BELL S/N 69198

CALIBRATED AIRSPEED KNOTS	GROSS WEIGHT LBS	LONG. C.G. STATION INCHES	LAT. C.G. STATION INCHES	DENSITY ALTITUDE FEET	ROTOR SPEED RPM
98	2920	107.5	-2.0	5000	554

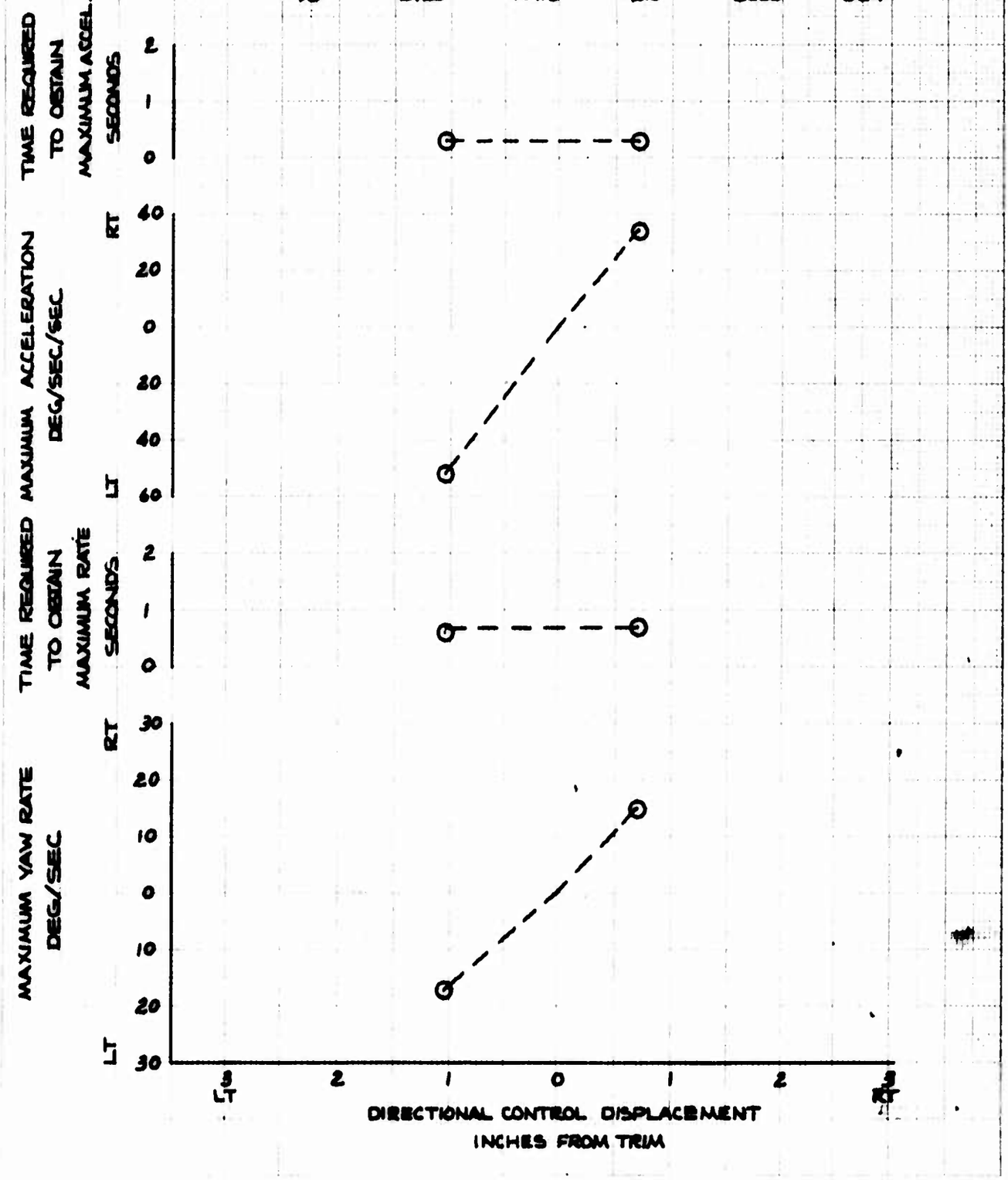


FIGURE No. 29
SIMULATED ENGINE FAILURE
LEVEL FLIGHT
OH-58A BELL No. 39998

GROSS WEIGHT LBS	LONG.C.G. STATION INCHES	LAT.C.G STATION INCHES	ROTOR SPEED RPM	DENSITY ALTITUDE FEET	TRIM AIRSPEED KNOTS
2980	107.4	-2.0	354	5000	100 KCAS

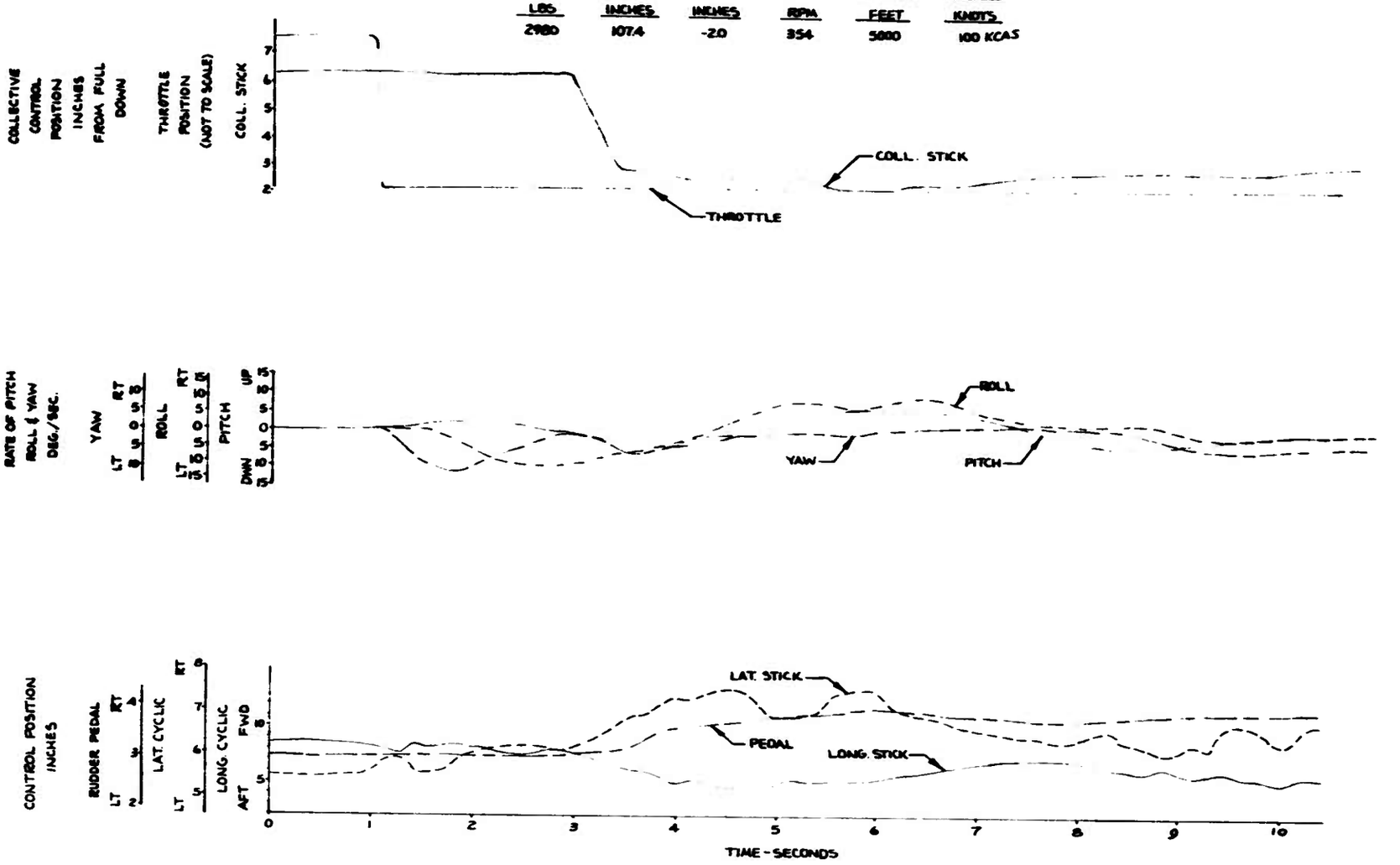


Figure No. 30
Simulated Engine Failure
Climb
OH-58A Bell S/N 39998

Gross Weight LBS.	Long. C.G. Station Inches	Lat. C.G. Station Inches	Rotor Speed RPM	Density Altitude Feet	Trim Airspeed Knots
2975	107.4	-2.0	354	5000	48 KCAS

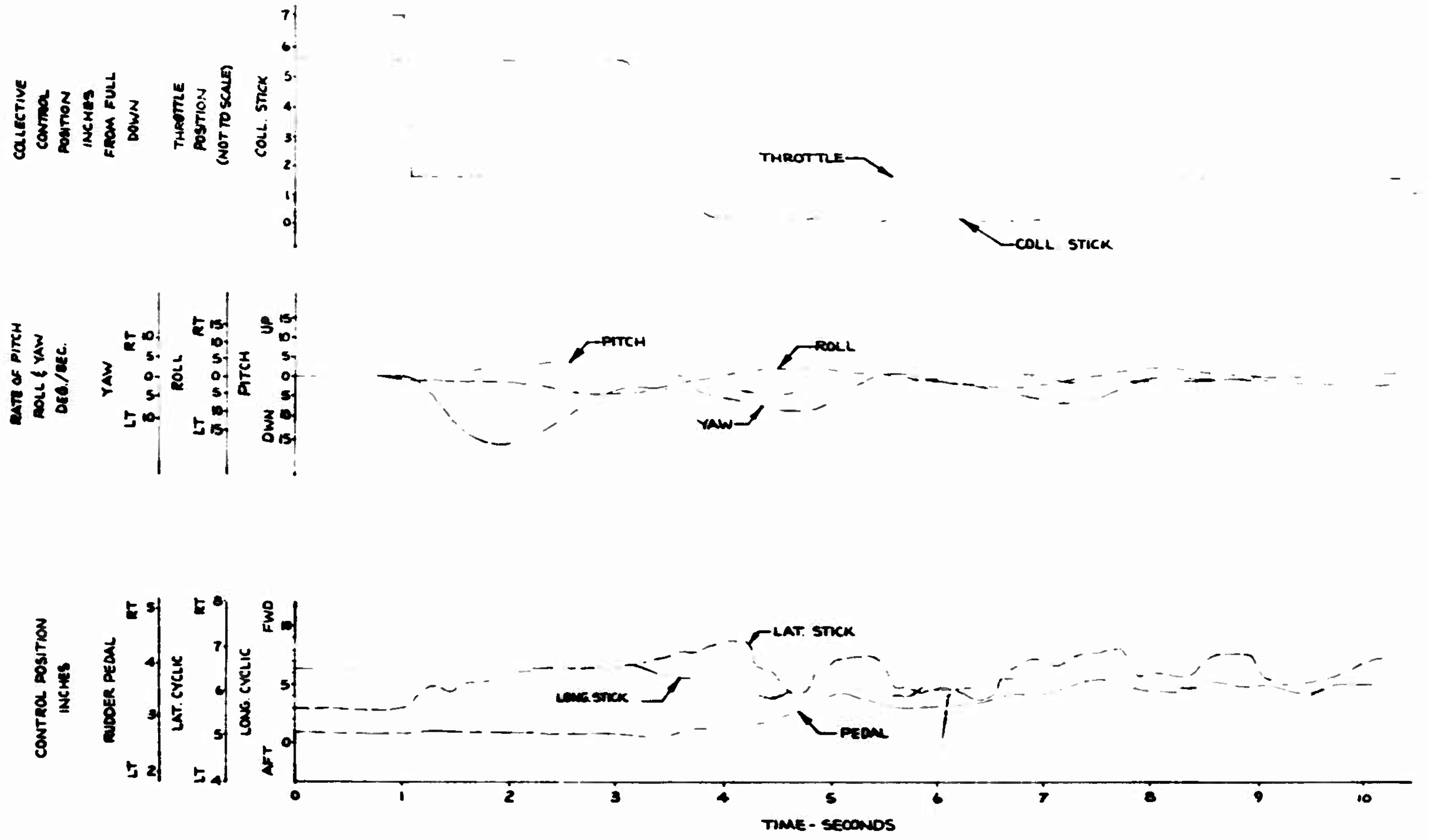


FIGURE No. 31
AIRSPEED CALIBRATION
YAW BOOM SYSTEM

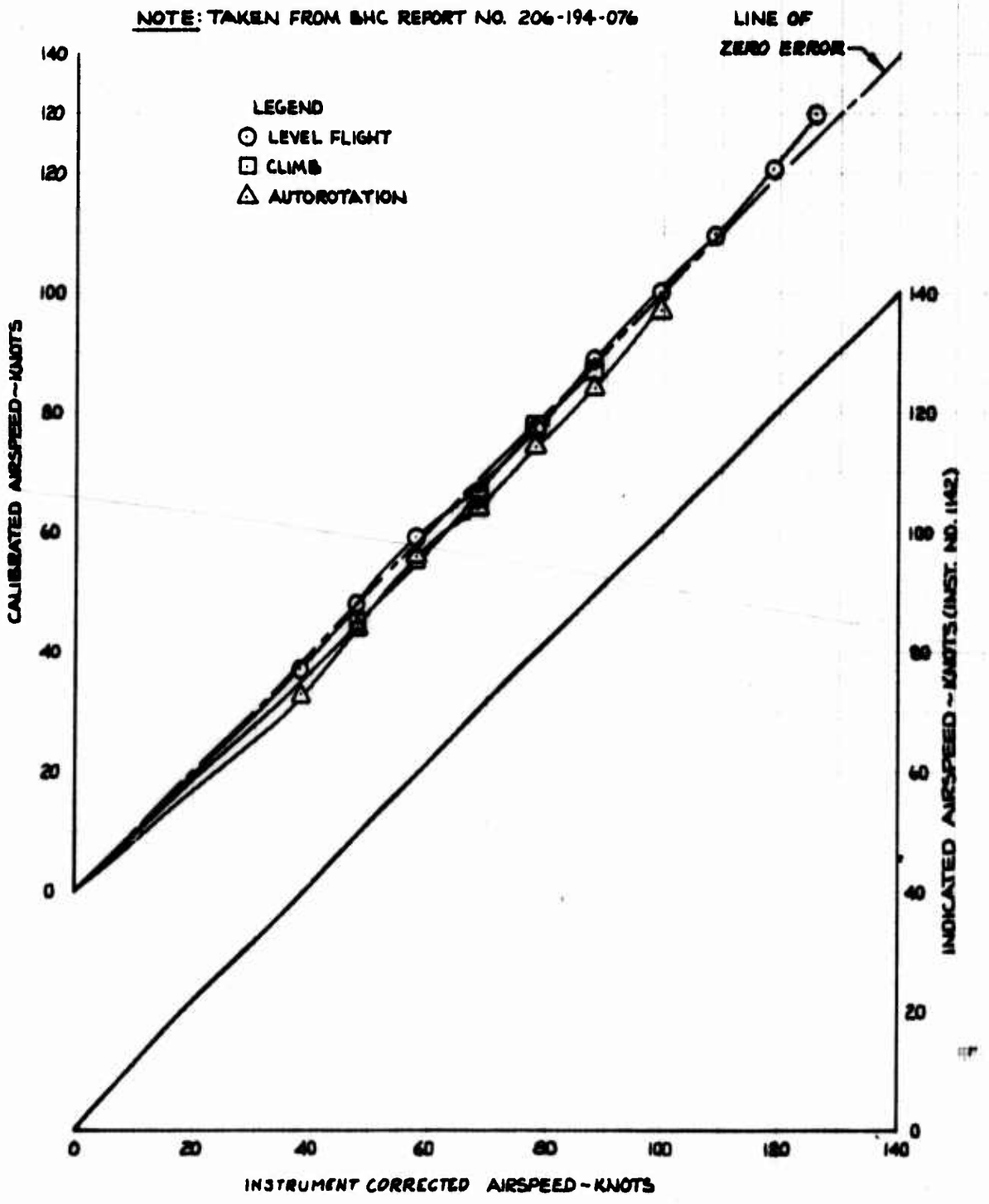


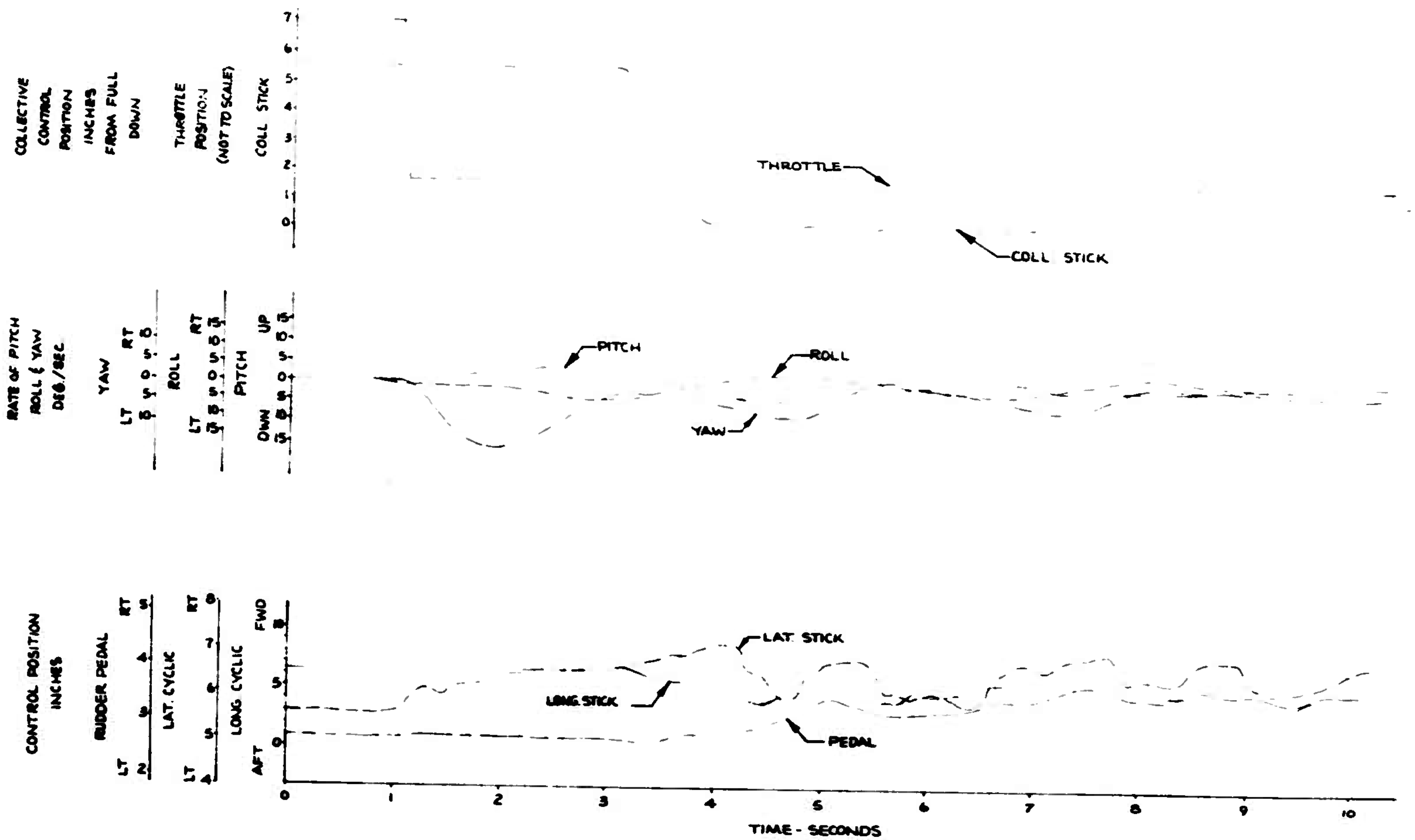
Figure No. 30

Simulated Engine Failure

Climb

OH-58A Bell S/N 39998

Gross Weight LBS	Long. C.G. Station Inches	Lat. C.G. Station Inches	Rotor Speed RPM	Density Altitude Feet	Trim Airspeed Knots
2975	107.4	-2.0	354	5000	48 KCAS



FIGU. No. 31
AIRSPEED CALIBRATION
YAW BOOM SYSTEM

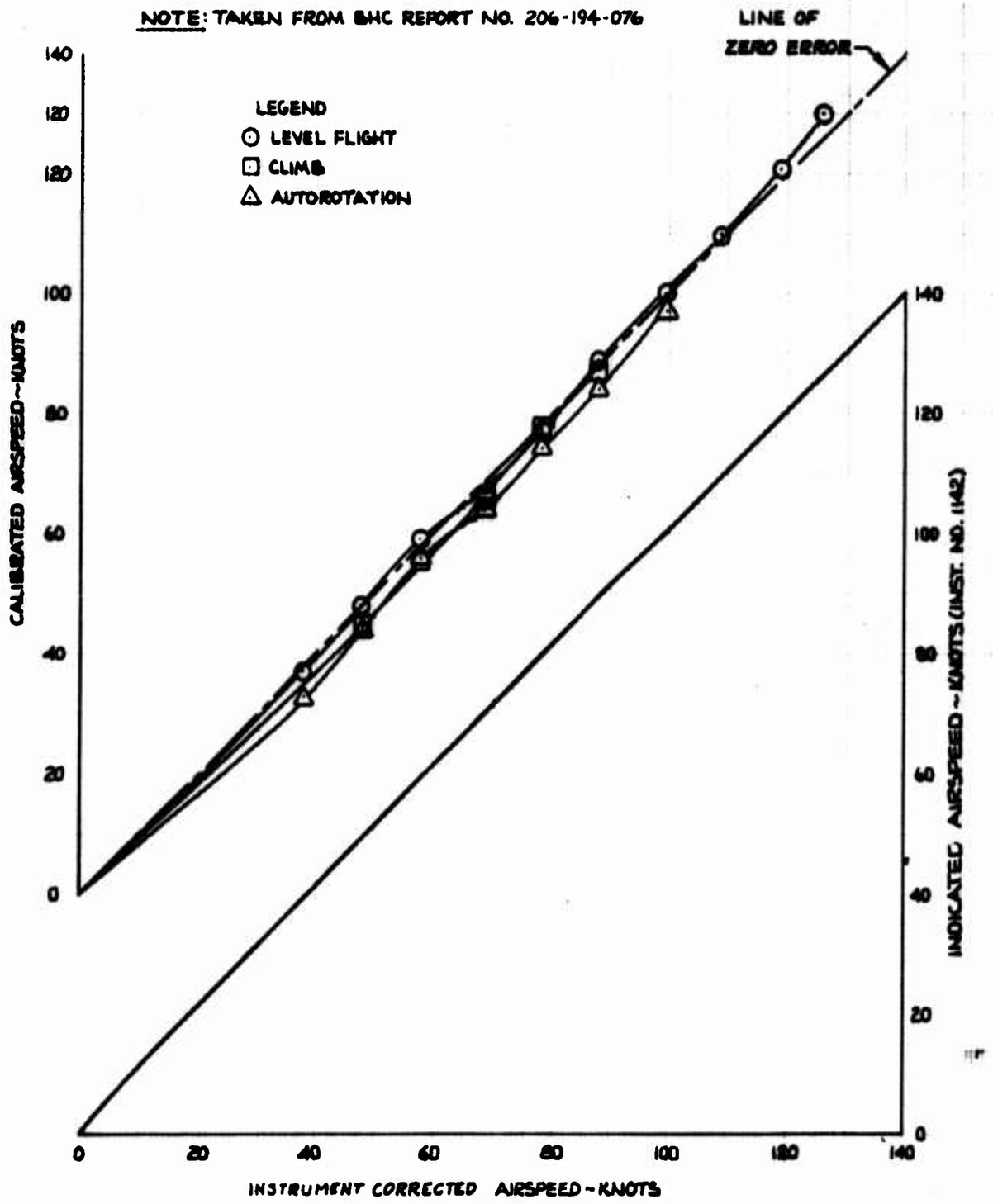


FIGURE No. 32

LIMIT SIDESLIP ENVELOPE
OH-58A BELL S/N 39998

NOTE: TAKEN FROM BHC SPECIFICATION NO. 206-947-031
MODIFIED 8 JULY 69

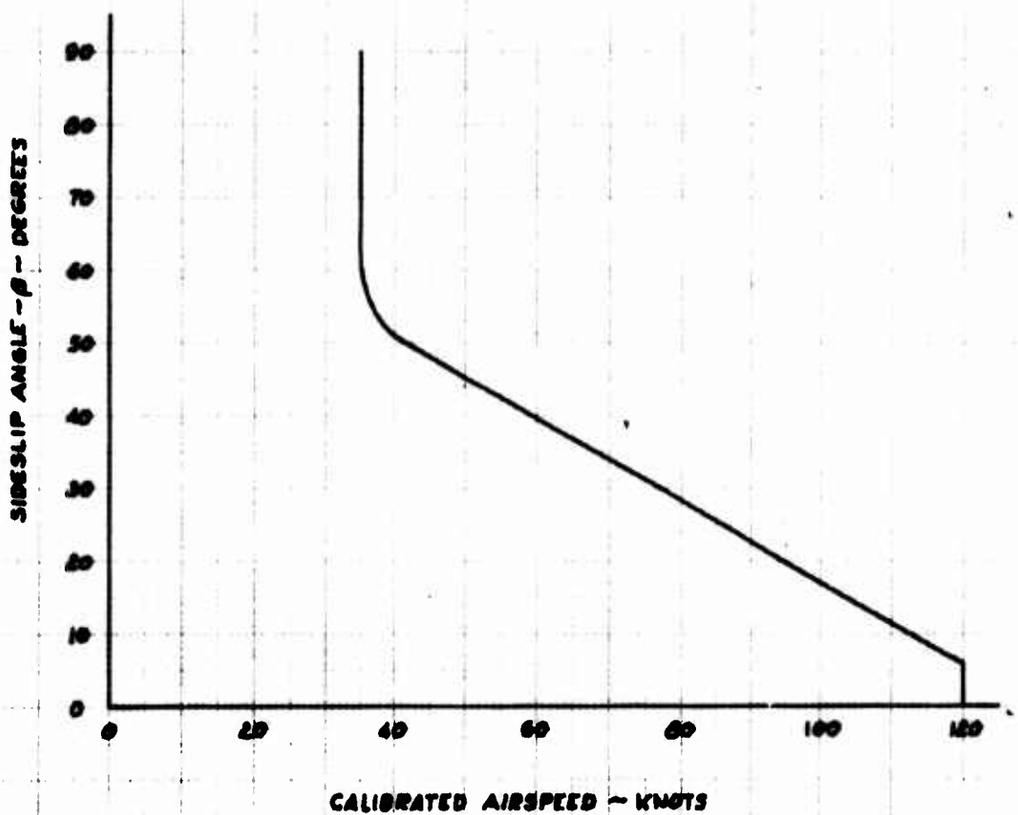
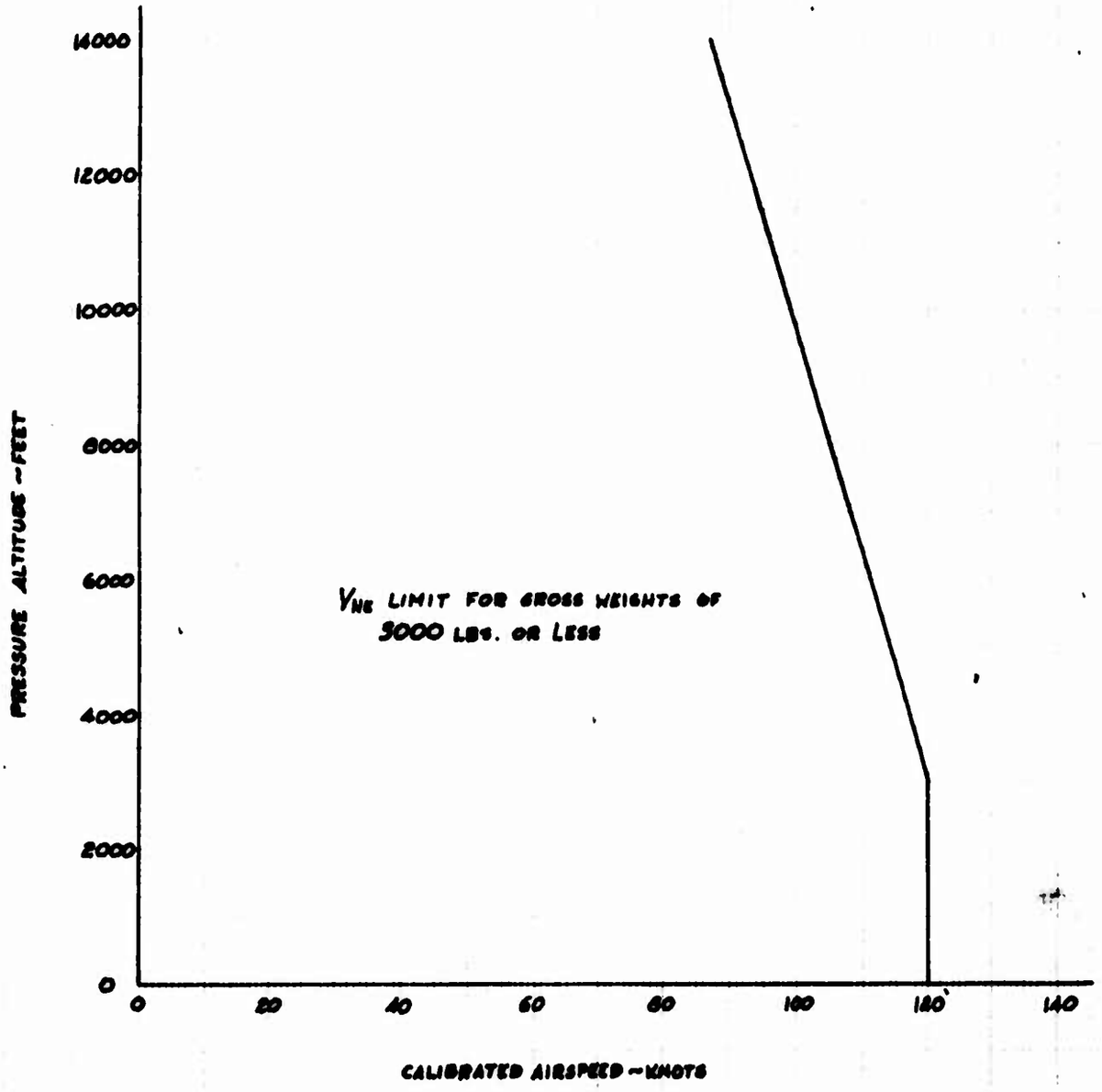


FIGURE No. 33
AIRSPEED ENVELOPE (V_{NE})
MODEL 206A-1 HELICOPTER

NOTE: TAKEN FROM BHC REPORT NO. 206-194-068



APPENDIX III. TEST INSTRUMENTATION

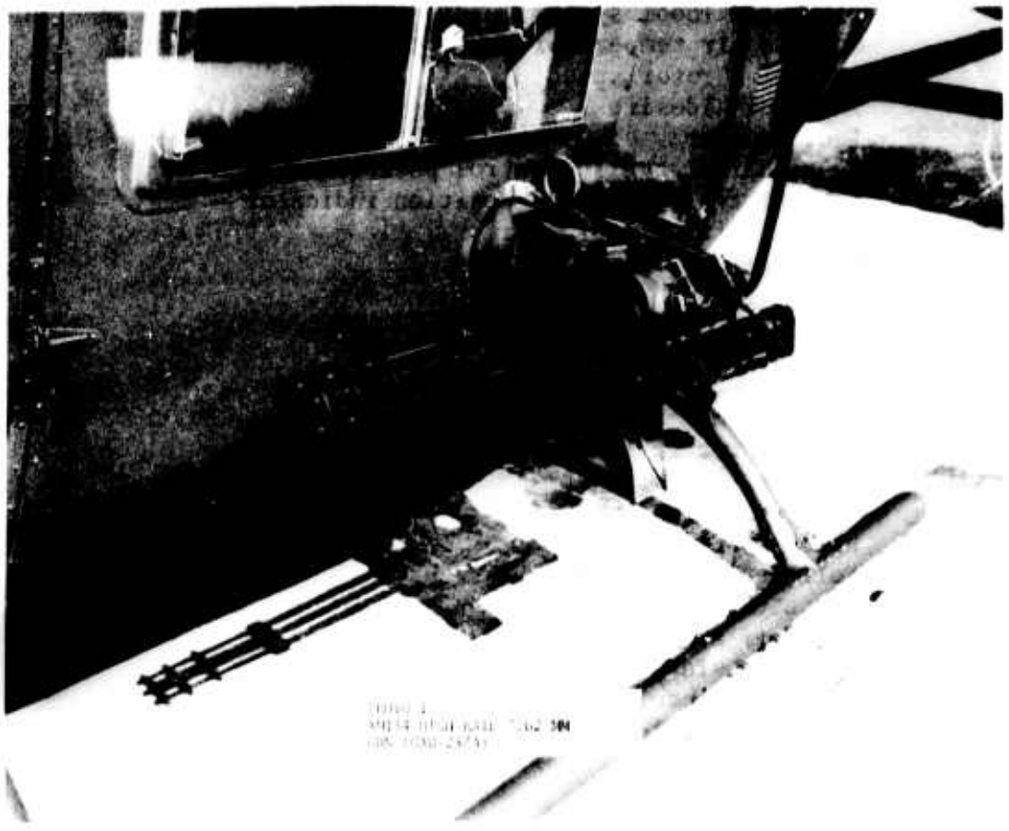
COCKPIT PANEL

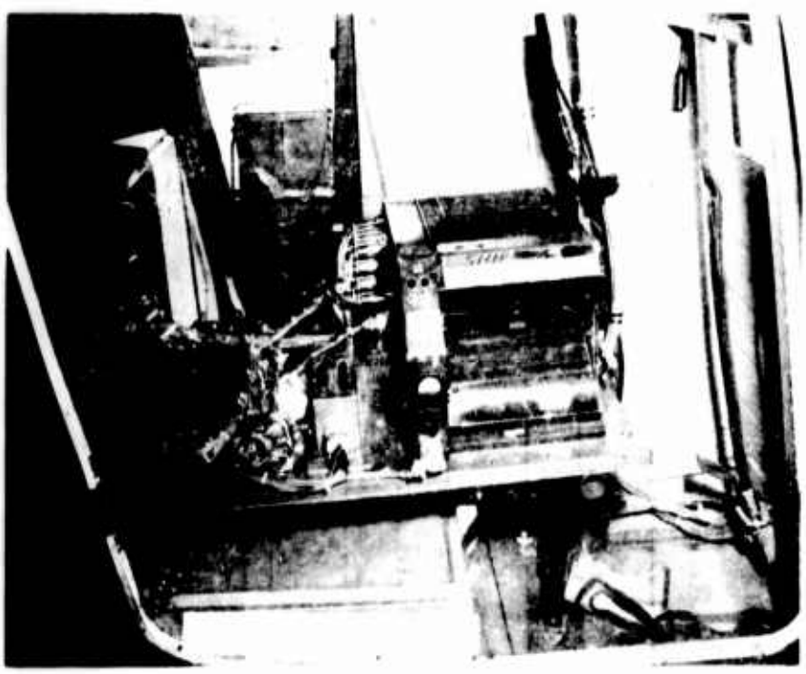
Airspeed (boom system)
Altimeter (boom system)
Outside air temperature
Sensitive rotor speed
Angle of sideslip
Fuel counter
Longitudinal cyclic control position indicator
Lateral cyclic control position indicator
Pedal position indicator
Oscillograph record counter

RECORDING OSCILLOGRAPH

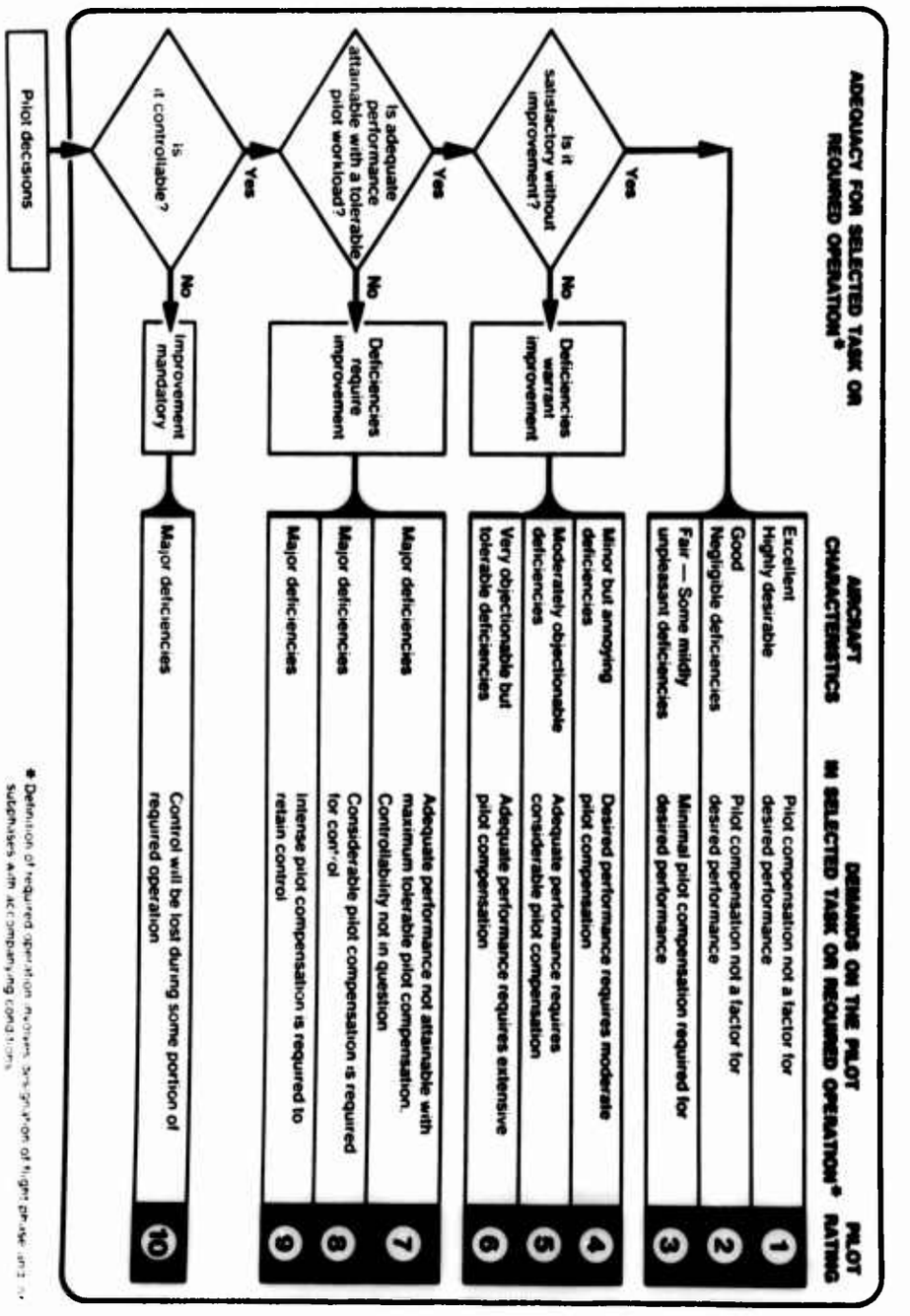
Longitudinal cyclic control position
Lateral cyclic control position
Collective control position
Pedal position
Pitch attitude
Roll attitude
Yaw attitude
Angle of attack
Angle of sideslip
CG normal acceleration
Vertical accelerometer
Event marker

APPENDIX IV. PHOTOGRAPHS





APPENDIX V. HANDLING QUALITIES RATING SCALE



* Definition of required operation involves designation of flight phase and subphases with accompanying conditions.

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Joseph Watts, Project Officer/Pilot

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13. ABSTRACT

The Army Preliminary Evaluation of the OH-58A prototype helicopter was conducted in the vicinity of Arlington, Texas, during the period 26 June to 9 July 1969. Thirteen test flights were conducted for a total of 14.5 hours of which 9.1 hours were productive. The evaluation consisted of limited quantitative and qualitative stability and control tests in the armed scout configuration only. The handling qualities of the OH-58A are satisfactory for the accomplishment of the armed scout mission.

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END
2 - 70